

# Technology Review

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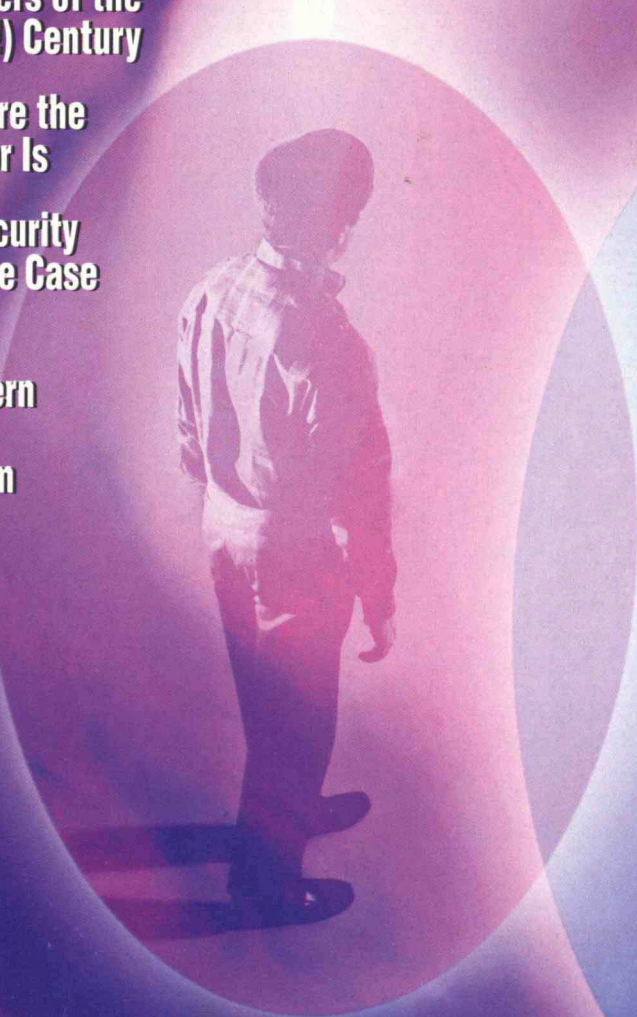
▶ Solar Engineers of the Nineteenth (!) Century

▶ Home Is Where the Heart Monitor Is

▶ Computer Security on a Chip: The Case for Clipper

▶ Making Eastern Europe Safe for Capitalism

▶ The Swiftest Ship in the Shipping Business



## *Protected from AIDS?*

HIGH-RISK PEOPLE  
WHO RESIST INFECTION  
INSPIRE A NEW APPROACH



# technology review

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
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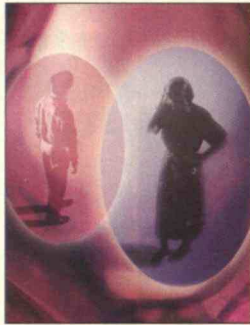
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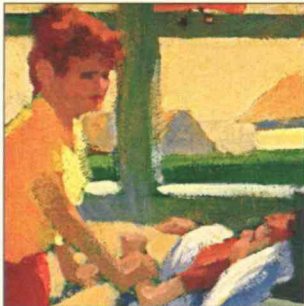


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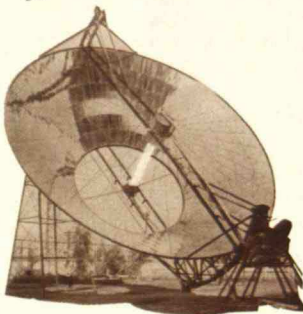


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BY DOROTHY E. DENNING

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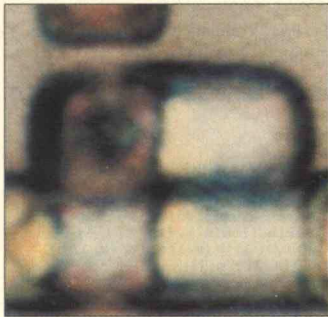
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Formerly communist nations have tried to privatize state-owned firms too quickly by cutting wages rather than modernizing manufacturing—an approach that has failed to attract many investors. Pulling the region's economies back from the brink will require government to remain involved with constructive and patient policies.

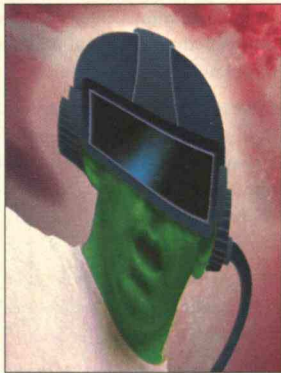


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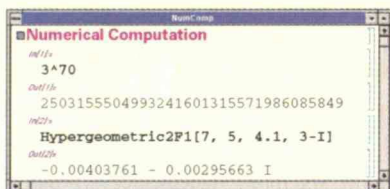
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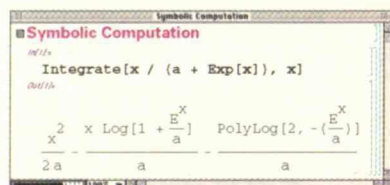
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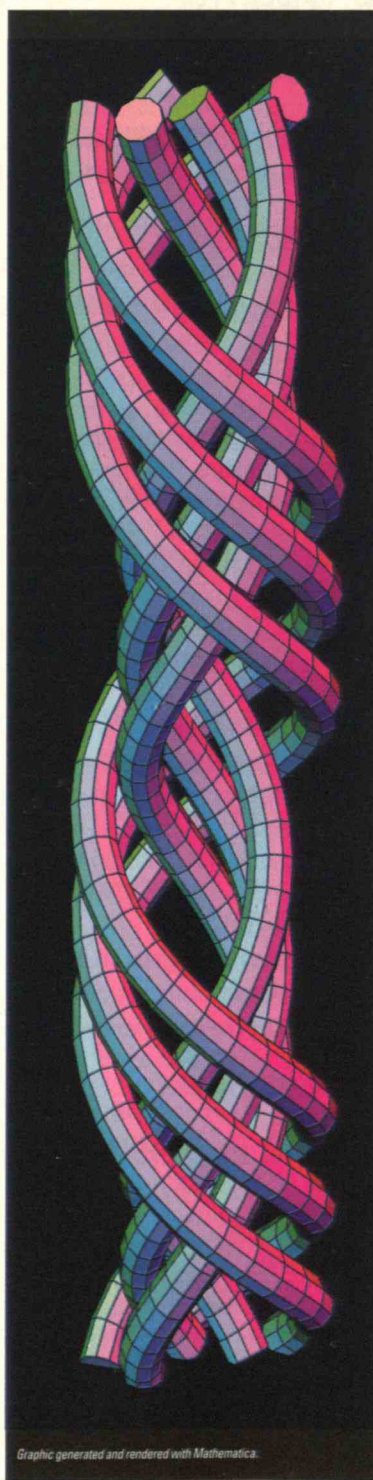


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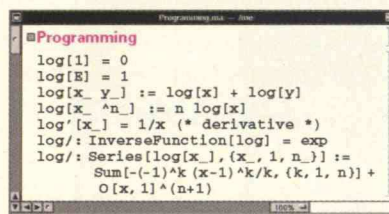


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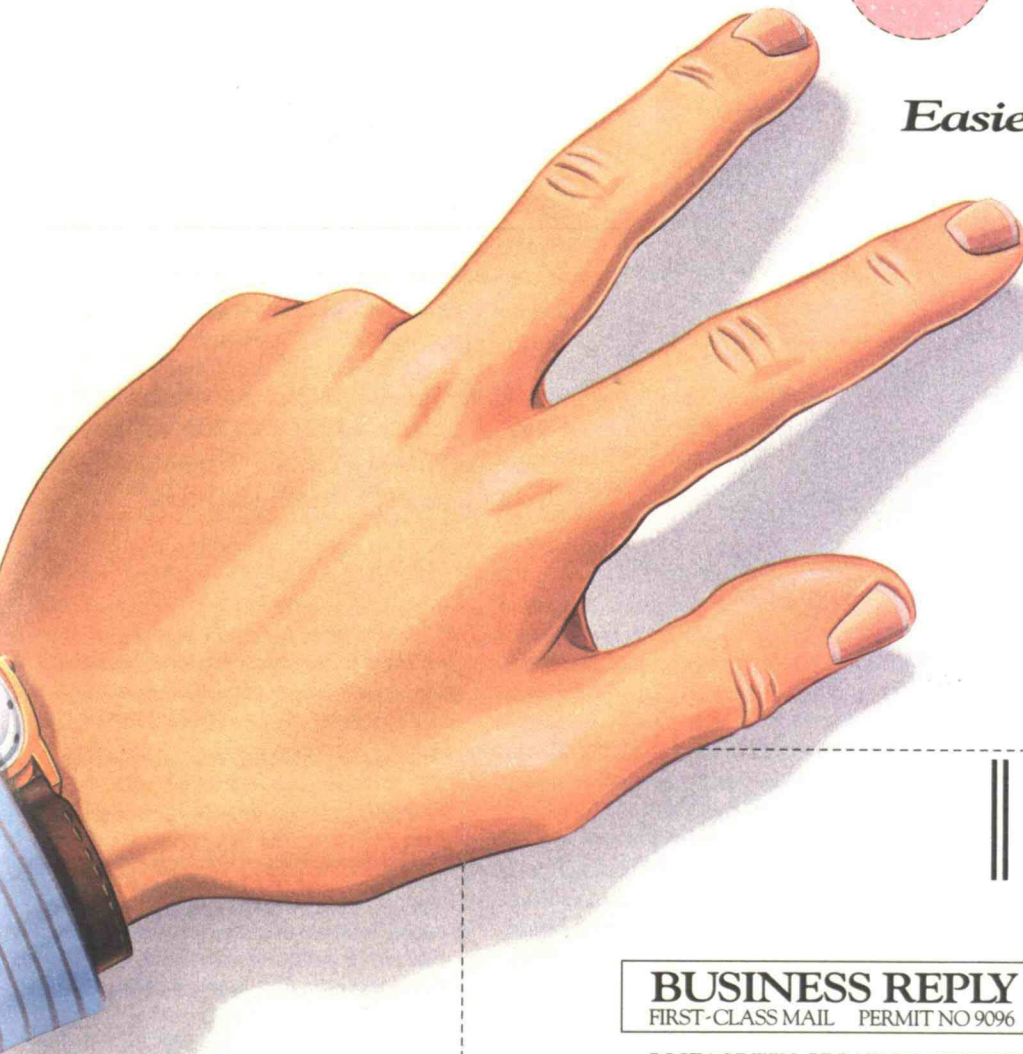
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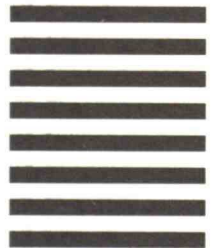
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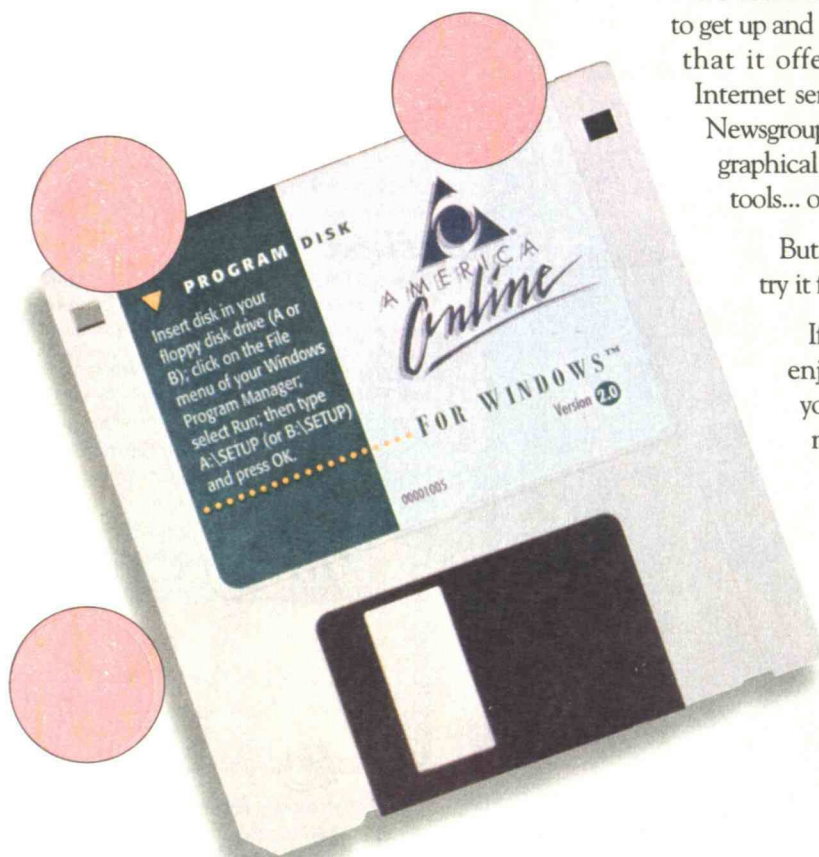
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## Debunking the Debunkers

MUSEUMS and libraries make me hungry. The immersion in great artistic and intellectual works stirs in me a craving for something elemental and simple: I don't want to leave the lobby without knowing where the snack bar is.

Something similar seems to be happening in the media now, regarding the phenomenally rapid growth of online communications, in particular the Internet. Pundits sampling the gigabytes of words and pictures are getting cranky, demanding that the Net give them something it's not designed for. *Newsweek* runs a piece entitled "The Internet? Bah!" The *New York Times* frets about the "addiction of life online." Commentators in *Technology Review* associate a variety of maladies with the growing interest in computer networking. And media critic Neil Postman, a professor of communications at New York University, heaps scorn on the notion that the Internet is the harbinger of a better society. "Cyberspace, shmyberspace," he intoned recently in a speech at Harvard, asserting that the last thing people need nowadays is more information.

Add the exaggerated complaints about how "flaming" renders the Internet incompatible with civilized discourse, and the despair that much online information on the Net is pretty frivolous—to many, it has become nothing but a cosmic sex boutique—and you have an entire genre of commentary: cyberbacklash. It has become difficult to utter the phrase "information superhighway" in polite company anymore unless accompanied by an ironic smirk alerting the listener that you never really fell for all that silly hype.

Thoughtful people are right, of course, to insist that information technologies deliver what their promoters promise. And there is certainly much to criticize. Many network enthusiasts display an annoying jingoism, a get-onboard-now-

and-we'll-solve-all-the-problems-later attitude—a kind of digital manifest destiny. It is also way too hard for even an experienced hand to navigate the Net, which lacks such basic amenities as comprehensive directories of people and services, and it can be a time sink for the undisciplined.

But the rush to spotlight all that is wrong with the Internet is itself an overreaction to excessively optimistic promises, fulfilling a cycle that is comically predictable to anyone who has followed

*If you  
don't like the Internet,  
wait a minute.*

---

the introduction of new technologies. First comes the buildup ("it will change the world!"), then, when the technology proves to be less than instantly revolutionary, the debunking.

As with many other technologies, debunking of the Net often goes too far. Some criticism paints an unrealistically sunny picture of the precomputer alternative, for example. Astronomer Clifford Stoll, who gained fame a few years ago as author of *The Cuckoo's Egg*, the tale of how he tracked down a German spy ring operating over the Internet, now charges that many of the Net's reputed benefits are a myth. In the recently published *Silicon Snake Oil*, Stoll—whose opinions carry substantial weight because of his unassailable credentials as a Net-using scientist of long standing—rhapsodizes about the old-fashioned card catalogs that computer databases have displaced from many libraries. But while extolling the beauty of the wood cabinetry and the look and feel of the little cards therein, Stoll says little about users' typical experience with a card catalog, which consisted of copying down lots of alphanumeric gibberish onto little slips of paper and then roaming the library, only to discover that half the needed books had been checked out or lost.

Similarly, in scoffing at the Net's contribution to civic life, critics implicitly award unearned points to the status quo. A *New Republic* essay derides Net rhetoric as more "alarming" than "noble"—as if conventional, off-line political speech always reverberated with Lincolnesque wisdom and Churchillian eloquence.

Many cybercritics deride the Net, and information technologies more generally, for their failure to exactly duplicate the real world. But why must there be only one "real world"? No one seriously thinks that cyberspace is a replacement for physical existence, where you get to smell, taste, touch, and eat. You can't curl up on the sofa and read an interactive CD-ROM like you can a printed magazine. You can't take a grand piano to the beach, either, but that doesn't make pianos less worthy than, say, guitars. On the other hand, you can copy a passage from a magazine article you're reading online and e-mail it to a dozen friends and acquaintances without breaking stride.

As a mass medium, the Net is still brand shiny new. Just an eyeblink ago, the only people who used computers to talk to each other were research scientists and hobbyists. Now, suddenly, your company has a Web home page and is trying (probably without much luck, so far) to sell products online. Your technophobic friend has fallen in love with e-mail, and your children are picking up computer-programming tips from strangers in Norway.

Anything that comes on so fast will have its flaws. I suspect that when we first started writing on paper instead of carving on stone, some people griped about the new medium's flimsiness while others clung to their chisels and smugly claimed that the expression of clear thinking required strenuous physical effort. But damning the Internet because it is not the Shangri-la that some hopeful boosters have claimed is like knocking Alexander Graham Bell for not thinking through the etiquette of call waiting.

—HERB BRODY

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# Letters

## DEFENSE-FIRM REALITIES

"The Myth of the Specialized Military Contractor" (TR April 1995) by Maryellen Kelley and Todd Watkins is very encouraging to those of us who feel that civil and military integration is the only long-term solution to obtaining an affordable and effective industrial base for the U.S. Department of Defense (DOD).

Many studies have shown that U.S. firms have been separating their engineering and manufacturing operations between their military and commercial efforts. The "defense way of doing things" has driven this separation through unique military specifications, procurement procedures, and accounting practices. The result is that DOD fails to reap the benefits of large-volume, low-cost commercial work that has increasingly included state-of-the-art technology. Led by Secretary of Defense William Perry, the number of advocates calling for the removal of such barriers to civil and military industrial integration has grown as the defense budget has decreased.

Kelley and Watkins argue that integration is already common in the machine-intensive durable goods sector. DOD would benefit from a study of how these firms overcame the barriers. There is more at stake than just the need to help current defense suppliers. DOD needs to be able to rely on world-class commercial suppliers who provide state-of-the-art equipment at low cost.

JACQUES S. GANSLER  
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We were delighted that *Technology Review* published Kelley and Watkins's provocative and original analysis of the defense dependencies (or lack thereof) of machine-intensive durable goods producers. Unfortunately, in our view, the arti-

cle's title "The Myth of the Specialized Military Contractor" was misleading.

The authors' survey did not cover all sectors of defense firms while it did include others with little or no defense orientation. It leaves out, for example, the shipbuilding, electronics, communications, and select service industries and did not give adequate weight to the largest, most specialized contractors.

We at the Rutgers University Project on Regional and Industrial Economics conducted a study of defense contractors that included a large-scale survey and intensive interviews at 120 firms. Our research suggests that as much as 40 percent of private-sector jobs supported directly or indirectly by the defense bud-

get are found in companies that are highly dependent on the defense industry. It is in this sector where barriers to diversification must be addressed to efficiently shift resources from defense to nondefense work, thereby saving jobs, skills, and communities. To make the transition, these firms must restructure their management, overhaul their marketing, initiate more cost-conscious production, and, above all, find a way to infuse capital. The transition is possible but not easy—even large dual-production firms like Hughes Aircraft Co. have found that they must separate commercial initiatives from defense to make the shift.

From reading Kelley and Watkins's article, one would never guess that hundreds of thousands of people have lost their jobs in defense-oriented firms during the past few years. The shame of it is that much of this loss could have been averted. Many firms failed because they could not make it through what we call the "transition trough," a period of two to three years when technical assistance, training, and bridging capital can make a difference. We agree with Kelley and Watkins that the problem is usually not the technology. Large-scale R&D efforts such as



the Clinton administration's Technology Reinvestment Project appear misguided to us. Much more bang for the buck can be found in locally based programs that direct funds toward community development, loan and equity funds, and hands-on marketing and technical assistance.

Unfortunately, these smaller programs are in jeopardy in Congress, slated for elimination so that more can be spent on dubious Pentagon "readiness" and far-fetched high-tech weapons research. Your headline could not have come at a worse moment, especially since the message is dead wrong. Specialized military contractors are not a myth. Underfunded conversion programs keep them tied to Seawolf submarines, B-2 bombers, and arms exports while layoffs persist.

ANN MARKUSEN

MICHAEL ODEN

JONATHAN FELDMAN

Project on Regional and

Industrial Economics

Rutgers University

New Brunswick, N.J.

### KEEPING AHEAD OF COUNTERFEITERS

As a member of three National Research Council committees concerned with counterfeiting threats and deterrent measures, I applaud Doug McClellan for his thorough and comprehensive article "Desktop Counterfeiting" (*TR* February/March 1995).

As McClellan notes, the amount of counterfeit money circulating in the United States is very small. However, the American public needs to realize the political and economic implications that any amount of counterfeit money poses. Since U.S. currency is highly valued worldwide, confidence in the dollar can be shaken, and eventually destroyed, by counterfeit money. An aggressive crackdown on counterfeiters would show the world that the United States is willing and able to uphold the integrity of its currency.

In 1990, the Treasury Department began to issue currency with microprinting around the portraits and a security thread that could be seen only in transmitted light. Although the deterrents had

been publicized, I informally surveyed cashiers, salespeople, and my generally well-informed friends and discovered an alarming lack of awareness and concern. This constitutes a serious threat to our currency's stability.

Assuming that the public and point-of-sale personnel can somehow be convinced that in order for the U.S. government program designed to protect them from counterfeiters to be successful, they must become familiar with the counterfeit deterrents and examine money they receive, especially larger denominations. Achieving these two simple and rudimentary objectives would reduce the number of poor facsimiles substantially. Much more important, prospective counterfeiters would learn very quickly that the risk of being caught was now dramatically increased. Furthermore, the quality of a fraudulent note would need to be excellent and would probably be beyond the capabilities of most amateurs and petty criminals.

Another major threat stems from the very rapid proliferation of inexpensive personal computer systems equipped with color scanners and printers, as indicated by McClellan, plus color copiers, especially multifunction ones that are also equipped with scanners. Such equipment makes it relatively easy for anyone with a properly equipped, low-cost personal computer system or access to a high-quality color copier to produce reasonable quality U.S. currency facsimiles. Thus, it has become possible for a very large and growing number of people to become counterfeiters whenever they feel the need for a few hundred or a few thousand dollars more than they can afford to spend. This potential source of counterfeit banknotes has indeed materialized but to a limited extent. According to data cited in the 1993 National Research Council report, \$6-8 million in counterfeit bills were produced by nonimpact printers in 1992. This value has doubled every year since 1989. Even more disturbing were indications in the last three months of 1992 and the first six months of 1993 that counterfeiters were being disseminated from 205 different locations. During this period, the number of counterfeiters pro-

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duced by ink jet printers increased dramatically but still amounted to only \$66,000.

Dissemination of small and highly variable numbers of counterfeit banknotes with random frequency from a very small number of constantly changing locations makes apprehension of such "crime of opportunity" counterfeiters extraordinarily difficult. However, there appears to be little or no justification for the supposition that the monetary value of counterfeit currency from these sources will double unabated every year through the year 2000 until the value has become a \$2 billion per annum problem. It is difficult to believe that the Secret Service and the public will not have instituted drastic countermeasures long before such a crisis condition materializes. Furthermore, long-term geometric extrapolations like this are almost never accurate because mitigating factors are not taken into account. Most of the counterfeit deterrents in the present and future U.S. currency are designed to foil these "crime of opportunity" counterfeiters by either making it so difficult to make a true reproduction that the individual will become discouraged and stop trying or by causing a copy to be so obviously a counterfeit that the individual will not attempt to pass it.

The final potential threat is complacency—reaction rather than pro-action on the part of the U.S. Treasury Department. All the National Research Council reports stress that professional and, to a lesser extent, petty criminals can learn to simulate or even duplicate any counterfeit deterrent given sufficient time because they have access to the same technology and are often very well funded. For example, within one year after the security ribbon was introduced, simulations, albeit poor ones, began to appear. Therefore, the objective should be to introduce new deterrents and combinations of deterrents frequently enough to keep the professionals off-balance and guessing.

JOSEPH GAYNOR  
President  
Innovative Technology Associates  
Ventura, Calif.

### NO HACKERS NEED APPLY

I find the conclusions in "Hackers Taking a Byte Out of Computer Crime" (*TR April 1995*) by Wade Roush rather disturbing. I don't see any prospects for reduction in tensions and eventual cooperation between information security managers, who are the defenders of information and privacy, and both current and so-called former malicious hackers, who are the violators



of information and computer privacy. The author quotes a biased set of people on the subject and has been deceived by the hackers he consulted.

Responsible information security managers are well advised to avoid cooperating with hackers. Yes, we talk to hackers, as I have for the past 25 years in my many research projects. However, such communication is done in the way we would talk to enemies such as thieves and embezzlers. Hackers possess limited skills and knowledge. There are plenty of expert and educated computer scientists and technologists who have proved themselves through their academic and professional achievements and earned our trust. By not hiring hackers, we are helping to stop this juvenile, irresponsible, and anonymous threat that is destroying the moral force in cyberspace and leading us into information anarchy.

DONN B. PARKER  
SRI International, Inc.  
Menlo Park, Calif.

Wade Roush did not make it clear that his article was an April Fool's joke. In the Unix community, hacker is a term of respect. Alan Southerton writes in *The Shell Hacker's Guide to X and Motif* that "a hacker is someone who is capable of solving problems; someone who knows a lot about many things." He goes on to say that "the correct name for computer villains is crackers."

HERBERT KOLLER  
San Francisco, Calif.

In the early days of computer hacking, such activity occurred within research labs where the lack of guidelines and subsequent discipline demonstrated that it was permissible. Today's crackers learn their techniques from an underground bulletin board system and act as though their self-perceived brilliance exempts them from the rules of society.

Hacking cannot be resolved without examining why information systems are so insecure in the first place. Places to start include the market's emphasis on price and performance at the expense of security, and U.S. export-control laws that deter computer systems from putting strong cryptographic facilities into products. Computer security can be improved by addressing these two security issues together. Hiring crackers isn't the answer.

JEFFREY I. SCHILLER  
Manager, Systems and Operations  
MIT Distributed Computing  
and Network Services



### PREMATURE COMET BUSTING

In "Comet Busters" (*TR February/March 1995*), author Peter Tyson quotes Gregory Canavan, a physicist at Los Alamos National Laboratory, as arguing that "a few hundred million dollars" is a worthwhile investment to safeguard against the impact of a large earth-crossing asteroid (ECA), because recovery could cost \$20 trillion per year for 20 years.

This reasoning is wildly fallacious because it ignores the time value of money. An ECA impact of the size Canavan mentions is estimated to occur once every million years; this means that the expected time we have to wait until the next such impact is 500,000 years. If we invested just \$1 today at 4 percent

compound interest, it would grow to more than 250 times the estimated losses of \$400 trillion in a mere 1,000 years.

The increase in risk to our planet is negligible if we wait a few hundred years before devoting a single penny to safeguarding against a large ECA. Furthermore, our descendants might be able to confront an ECA at a cost that is trivial in terms of their money. I suggest we spend our funds on concerns more immediate than large ECAs.

THOMAS W. CUSICK  
Professor of Mathematics  
State University of New York  
Buffalo, N.Y.

### OUR PLANET, OURSELVES

In "The Ultimate Preventive Medicine" (*TR November/December 1994*), Eric Chivian justifiably laments the health implications of the degradation of the world environment. A significant part of the degradation, he believes, is caused by the generation of greenhouse gases and the probable rise of global temperature. By their sheer existence, humans and animals use oxygen and release carbon dioxide. However, humans exacerbate the ratio between oxygen and carbon dioxide by burning coal, oil, wood, and gas.

Although Chivian is obviously arguing for a reduced birth rate, he simultaneously advocates actions to prolong lives. Despite the conflict between these points, Chivian must be commended for his sensitivity to fellow humans. Not many of us will volunteer to be the agent of reducing the living population.

Because the goal of every human, whether conscious or not, is to increase energy consumption, we must choose between eliminating this growing demand and providing energy without continuing to harm the environment. I support the latter option through the use of nuclear reactors.

But, if we want the nuclear reactor to work safely as our servant, we must first rid ourselves of the tendency to react in horror at the thought.

WILLIAM G. DENHARD  
Reading, Mass.

*Continued on Page 70*

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# MIT Reporter

## THE SWIFTEST SHIP IN THE SHIPPING BUSINESS

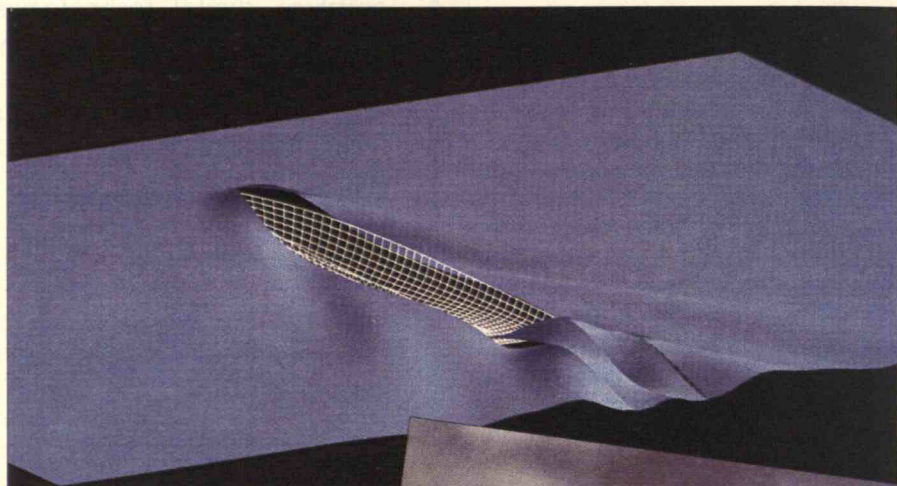


The FastShip, a jet-powered cargo vessel being proposed for service between the United States and Europe, may be the Barbra Streisand of transoceanic shipping: it packs a lot of power, has a distinctive prow, and slices through those high seas "like buttah." If it also had the entertainer's proven track record, its developers wouldn't need MIT's help. But as it happens, FastShip Atlantic, Inc., of Alexandria, Va., is attempting to forge a whole new transportation market using technology never before applied in large ships. To improve its chances of success, the company has enlisted MIT's Department of Ocean Engineering and Center for Transportation Studies, to both evaluate the vessel's design and test the market for high-speed shipping.

As its name implies, the essence of the FastShip concept is speed. The vessel, once built, will cruise at 42 knots (48 mph)—roughly twice the rate of conventional freighters—cutting the transatlantic crossing from seven or eight days to three and a half. The key to this improvement is the ship's "semi-planing" hull. While the stern of an ordinary ship drives deeper into the water as speed increases, the FastShip's stern is wide and shallow, with a hydrodynamic curve that lifts it partway out of the sea at high speeds. The hull design also calls for a deep, V-shaped bow that can plow through 50-foot waves at full steam.

Mariners have a name for this ability to maintain poise in rough waters: seakeeping. According to Paul Sclavounos, an MIT professor of ocean engineering who has finished a preliminary analysis of the FastShip's hydrodynamics, it is seakeeping that sets the vessel apart from other large freighters. "In the severe sea states we've looked at so far—with wave heights of 6 meters—this design seems to experience only about a 5 percent increase in resistance, which is a very low number."

The hull shape behind these figures is not new. FastShip Atlantic is licensing



*MIT ocean engineers are fine-tuning the bull design of the planned FastShip freighter with the aid of software that simulates the vessel's behavior in water. The unusual rooster-tail-shaped wave in the printout above results from the ship's wide, flat stern (right), which rides high even at speeds of more than 40 knots.*



the patent from the British marine engineering firm Thornycroft, Giles and Co., whose design has been used in smaller naval and passenger vessels (less than 200 feet long) since the 1960s. But FastShip Atlantic intends to scale up the design for freighters ranging from 560 to at least 860 feet in length.

These massive vessels will be pushed hard. Six to eight gas turbines—jumbo-jet engines specially modified by General Electric—will drive five water jets, which work on the principle of a jet ski, moving large volumes of water to propel the vessel. Like semi-planing hulls, jet propulsion has yet to be tried on large ships.

Another innovation is rapid cargo handling. Containerized goods will glide on and off the ship on large metal pallets buoyed by a cushion of air. A train of pallets will be pulled by a single tractor. According to FastShip Atlantic, this system, which it calls Alicon, will enable stevedores to load and unload cargoes in four to six hours instead of one to two days. The company's overall

goal is to shorten door-to-door delivery times for goods from the typical 14–35 days to 5.

### Speedy Delivery

What kinds of exports would benefit from a delivery time of five days? "Lots of exports," says Robert Simpson, a professor in MIT's Department of Aeronautics and Astronautics who is heading the market feasibility study (and whose earlier research on air cargo led to his broader interest in freight). An obvious prospect is cars. Time spent waiting on docks and in transit is costly to automakers, says Simpson. Volvo is so eager to cut its delivery times that it is helping FastShip Atlantic set up service between Gothenburg, Sweden, and the transatlantic hub port of Zeebrugge, Belgium. FastShip Atlantic expects to have a 560-foot vessel built and operating on that route by the end of 1996. In 1998, when—if all goes as scheduled—the

shipping company will start running four 863-foot vessels between Zeebrugge and Philadelphia, Volvo plans to have its cars on board. Simpson says U.S. automakers have also expressed interest in the FastShip line.

Since January, when the collaboration between MIT and FastShip Atlantic was announced, Simpson has been working to identify other industries that stand to gain from rapid shipping. Clothing, pharmaceuticals, medical equipment, consumer electronics, and perishable goods are high on the list, he says. "But really any cargo of high value would be suitable."

The value of goods is a consideration because jet-age sea travel exacts a toll in fuel. FastShip Atlantic will charge a premium beyond the typical shipping cost of 7 to 18 cents per pound. But as Simpson reads the market, "there is room for them to charge perhaps 20 or 50 percent more and still have happy shippers."

What shippers get in return, according to Simpson, is not just speed but reliability. North Atlantic freighters are so vulnerable to heavy seas that they seldom arrive on time. "Trucking companies won't even send a truck to the dock until the shipping company calls to say the freighter is sitting at the berth," says Simpson. With the FastShip, he predicts, "truckers will know to arrive at twelve o'clock for a one o'clock unloading."

Meanwhile, back in the lab, Sclavounos is studying the vessel's hydrodynamic properties with a computer-simulation program called SWAN (short for "ship wave analysis"). In the past, Sclavounos has used SWAN to help design several America's Cup entries, including *America*<sup>3</sup> in 1992 and *Young America* in '95—assignments that he says have stood him in good stead for evaluating the new freighter. "You'll notice that America's Cup yachts have shallow, wide sterns that come out of the water in a very unshiplike way," he says. "They are not unlike the FastShip in many respects."

Sclavounos expects any recommendations that emerge from his analysis to



## PHOTO CONTEST

Attempts to devise a clever solution to a problem can yield not only answers but also the distinct pleasures associated with creativity. Thus during this year's photo contest, **"In Search of Ingenuity,"**

*Technology Review* hopes to receive images capturing some of the resourceful techniques people use as well as the emotions they experience as they invent.



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be modest. "The basic design is there, but we may suggest some refinements," he says. "If we can find small variations to the hull shape to improve resistance, the developers would definitely be interested because of the high fuel costs." He estimates that even a 1 percent improvement could save \$1-2 million in fuel annually.

Hydrodynamic analysis is only the first stage in MIT's study of the FastShip, according to Chrysostomos Chrysostomidis, head of the Department of Ocean Engineering. Next comes an examination of the ship's structure—"the challenge is to make it lightweight yet capable of withstanding the additional loads imposed by high speeds," he says—followed by a study of the propulsion system.

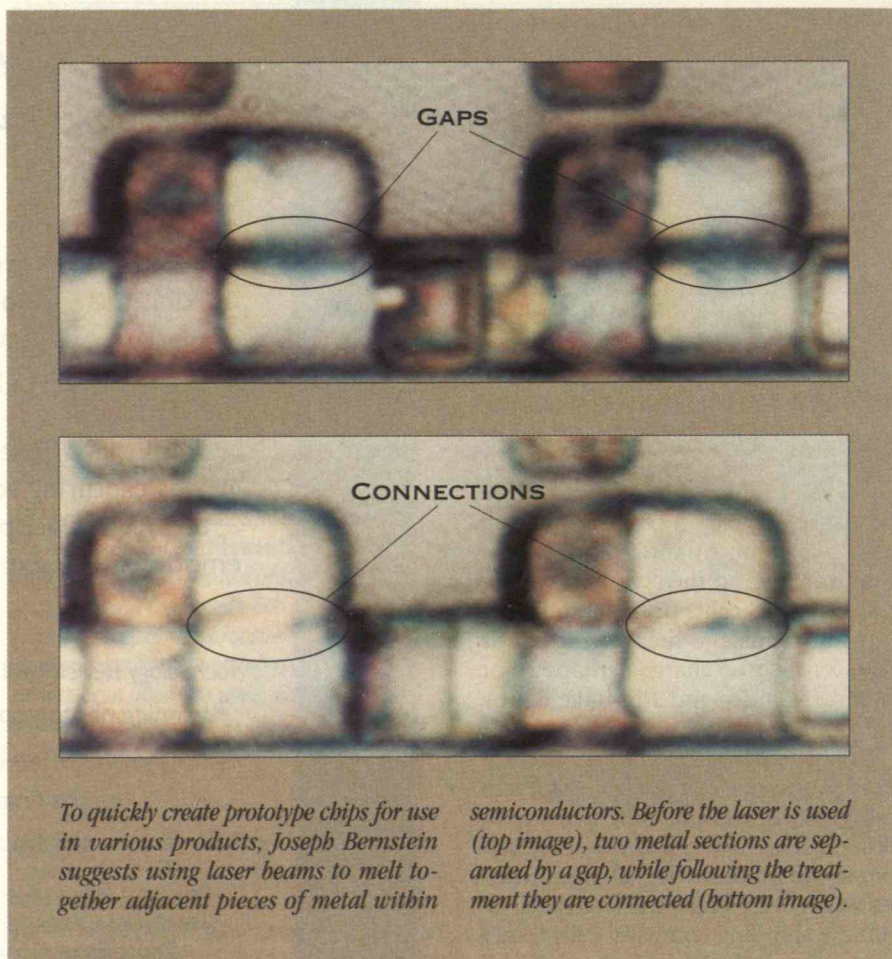
Inspired by work on the FastShip project, Chrysostomidis and Scлавounos are now attempting to set up a center for studying fast-ship concepts generally. Advances in this area could revitalize the stalled U.S. shipping industry, says Chrysostomidis—especially if the new vessels are built at domestic shipyards (FastShip Atlantic has yet to announce a construction site). And the complexity of high-speed shipping will provide research material well beyond the one-year period officially devoted to the MIT-FastShip Atlantic collaboration. Says Chrysostomidis: "It's a beautiful problem."—DAVID BRITTAN

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## CHIP ZAPPING



With computer chips embedded in everything from garage-door openers to telephones nowadays, product refinements are forcing manufacturers to continually tweak the microcircuitry design of their semiconductors. And that means first having to test multiple iterations of prototype chips before ordering thousands of copies from a factory. A researcher who is working at MIT-affiliated Lincoln Laboratory has



devised a technique that could substantially improve the process for making such prototypes.

Manufacturers often rely on a semiconductor device known as a gate array. A gate is a group of a few (usually four) transistors that perform a particular logic function; a NOT gate, for example, simply inverts digital input—turning ones into zeroes and vice versa. Interconnections among thousands of gates yield a device that is capable of complex arithmetical and logical operations.

A gate array is, in a sense, an unfinished electronic symphony; the logic gates are all in place, but the wiring to connect them is left incomplete. The chip's final wiring can be finished, in accord with the company's particular specifications, in as little as a few min-

utes. Such rapid turnaround streamlines the testing of custom chips and hence the product development cycle.

Despite this success, the finishing processes now used to transform a generic gate array into the electronic device that a manufacturer specifies fall far short of ideal. Like other microelectronic chips, gate arrays are composed of multiple layers of semiconductor, insulation, and metal. In one common method, pulses of voltage are applied to the chip at specified points to form electrically conducting channels between gates. The connections made are imperfect, however, with high electrical resistance and capacitance that slow down the chip's operation. Moreover, this technique requires that the gate array be equipped with a processor programmed with instructions on

where to apply voltages to forge desired connections. This circuitry occupies prime semiconductor real estate that is then unavailable for the chip to do its intended job.

In the past few years, a different method of finishing gate arrays has arrived on the scene. This technique starts with a gate array that has been totally interconnected: the output of every gate is connected to the input of every other gate. To customize the chip, a product manufacturer—a computer company, for example—uses a laser to sever all the connections *except* for the ones needed in the specified design. This “break link” process is like buying a 500-room house and then creating the desired floor plan by knocking down 450 of the dividing walls.

#### Gentler Connections

But severing a connection requires an intense laser pulse; as chip designers cram more and more circuitry onto each piece of silicon, such an energetic burst could ruin the delicate transistors close to the beam, says electrical engineer Joseph Bernstein, who left MIT's Lincoln Lab in June to become a professor of materials and nuclear engineering at the University of Maryland.

Bernstein has devised a prototype-finishing technique that uses lower laser energies and thus, he reasons, should work well for densely packed chips. His chief innovation is to use the laser beam not to break connections but to make them. He shines a beam onto two adjacent lines of metal with just enough energy to melt each one. The molten puddles coalesce and cool to leave a new electrical pathway. Making links in this fashion requires only about one-fifth as much laser energy as breaking links, Bernstein says. The ability to use a gentler laser beam, he asserts, also lowers the risk of damaging nearby transistors.

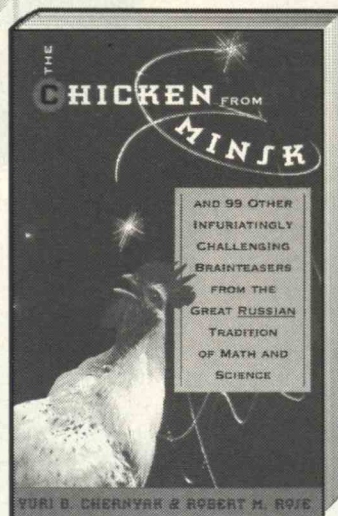
The laser make-link process should actually become more effective as transistor density rises, Bernstein claims. In fact, he says, the process has become feasible only as the distance between lines

of metal has dropped below one micron. And as semiconductor devices continue their inevitable shrinkage, the process would require only a tighter focusing of the laser beam to retain its usefulness. That shouldn't be a problem: the in-

frared laser Bernstein uses can be focused to a spot as small as 0.35 micron, which should take care of devices envisioned for the remainder of the decade.

—HERB BRODY AND LAURA VAN DAM

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# Trends

## Cybersickness: The Side Effects of Virtual Reality

■ Certain events never occur on the "holodeck," a virtual environment

on *Star Trek's* twenty-fourth-century starship *Enterprise*, where holograms are so realistic they are indistinguishable from reality. Captain Jean-Luc Picard does not conclude his fantasy life as a hard-boiled, pulp-fiction detective by puking all over the ship's clean floors. When second-in-command William Riker leaves off a romance with a computer-simulated dance-hall girl, he does not traipse back to the helm to fire a photon torpedo when he merely means to hail an alien ship. And Geordi La Forge, the ship's engineer, does not experience flashbacks the day after he confers with a holographic projection of the designers who created the ship's engine.

Unfortunately, such side effects and more bedevil users of today's virtual reality simulations. Such symptoms have been noted since the late 1950s, but in the last 20 years, studies by both the military and the National Aeronautics and Space Administration (NASA) have shown just how extensive simulator sickness and cyber side effects really are. In 1987 John Caseli, director of the auditory systems laboratory at Virginia Polytechnic Institute, surveyed available data and found that the rates of all types of simulator sickness ranged up to 90 percent, depending on the simulator. Another survey by Robert Kennedy, a psycholo-

gist with the Orlando branch of Essex Corp., which specializes in human-machine interactions, suggests that an average of 30 percent of people who use some kind of simulator exhibit classic symptoms of motion sickness, such as cold sweats, nausea, and vomiting.

In a generic sense, virtual reality is any

the scene shifts accordingly, and special gloves transmit motion signals to the computer, which then responds by moving simulated objects on screen.

Most people who suffer cybersickness from using this technology may sweat, salivate, turn pale, as well as experience headaches, fatigue, and nausea. (See

*"Knowing Where Your Head Is At,"* TR February/March 1995, page 10.) But what most worries psychologists who study the phenomena is the dramatic disorientation that can occur. For example, Frank Biocca at the University of North Carolina at Chapel Hill once had a colleague test a virtual reality headset designed to show doctors how organs and muscles were likely to appear inside the bodies they were cutting open. "When she took off the headset and went to drink from a can of soda, she found she was pouring the soda into her eyes," he says. "You can see that this has distressing implications in a system intended to be used in the operating room."

And then there are the flashbacks. Kennedy recounts a pilot's vivid flashback while driving his car the day after he operated a simulator. "He had to pull over to the side of the road and walk around and touch things to see if they

were real," he says.

No one is quite sure how long these various side effects last. But one study by Kennedy and his colleagues found that 14 percent of helicopter pilots who trained in a simulator reported motion sickness symptoms lasting more than 6 hours, while other studies found flashbacks, balance disturbances, and disorientation lasting up to 12 hours. The



technology in which a person interacts with a computer-generated world that appears more or less real. Of late the term has come to describe a truly immersive environment where users wear head-mounted displays with earphones and a screen in front of each eye showing projections of computer-generated images that encompass a person's entire field of vision. As the user's head turns,

effects are so pronounced that the Army, Navy, Marines, and NASA won't let people who experience cybersickness fly or drive until 24 hours after the symptoms subside.

Younger individuals appear even more prone to the effects. An analysis by Kennedy suggests that the likelihood of exhibiting symptoms is greatest between the ages of 2 and 21 and dramatically diminished after the age of 50. "This is bad news for companies that make virtual reality systems," says Biocca, "because this is precisely the group that is most likely to buy them."

### A Lawsuit in the Making?

Industry analysts say cybersickness may create roadblocks to greater use of a technology that is expected to constitute a third of the market for home video games by the end of the century. In fact, experts predict it's only a matter of time before virtual reality system manufacturers will be hauled into the courtroom because of accidents stemming from the psychological side effects. "The big concern is little Johnny who spends four hours a day inside his virtual headset," says Arthur Zwern, president of the General Reality Co. in San Jose, Calif., which makes headsets used in virtual systems. "All it will take is one kid getting hurt and there will be a big brouhaha. It will be like the Pinto's exploding gas tank."

Why do people suffer cyber side effects? The most widely accepted explanation is that they result from a sensory conflict between what you see and what you think you should be seeing. If you think something is over to the left, your eyes turn and look left. But even in the best simulators there is a certain lag time for the computer images to react to the user's head and body movement. Even delays as short as a third of a second can confuse the brain and the inner ear's balance system.

Why exactly this should produce nausea, coordination problems, and flashbacks is not entirely clear. Kenneth Money, a former Canadian astronaut and

now a motion researcher at the Defense and Civil Institute of Environmental Medicine in Downsview, Ontario, has done studies with dogs suggesting an unexplained connection between the body's sense of balance and its response to ingesting something disagreeable like a poison. When the brain gets the message—whether from actual motion or a computer simulation—that the body is being thrown off balance, it may accidentally trigger the anti-poison response of nausea and vomiting.

Money says that coordination problems may simply be a result of the body adjusting to the real world in the same way that we need time to adjust to walking on solid ground after being on a ship for any length of time. And he thinks the flashbacks may be an extreme déjà vu experience, whereby some cue in the real world vividly reminds the user of a recent experience in virtual reality.

Although the evidence of cybersickness is well-documented, it is virtually never mentioned during discussions of the technology. One reason may be that developers are too absorbed in getting their application to work. In fact, it is usually not until after the design is frozen, says Kennedy, that the effect of a game on humans is considered. For example, after a year of promoting a \$200 home virtual reality game for its Genesis 16 system, Sega Corp. announced in January that it would not be selling the system after all. Thomas Piantanida, a researcher with SRI International, an independent research company in Palo Alto that evaluated the prototypes, told colleagues at a scientific meeting that some 40 percent of Sega's users were experiencing cybersickness.

Some companies have begun addressing the problem by reducing the immersive nature of their games to cue the brain that the time lags it picks up should not be taken for real. By cutting down the field of view, for example, and allowing users to see their feet, they can create an effect more like that of a television set floating before their eyes. That way, users can see other parts of the real world around the projections.

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Limiting the time users spend on a machine is also a clear safety feature, since numerous studies have shown that the likelihood of cybersickness rises with the length of such time. For example, researchers at Emory University and the Georgia Institute of Technology, who recently reported that they were able to help people overcome their fear of heights using a virtual reality application (see "Facing Real Fears in Virtual Worlds," *TR* May/June 1995, page 16), found the treatment worked only after each session was cut from about an hour to 35 minutes. Longer immersion periods were making people more cybersick than height sick.

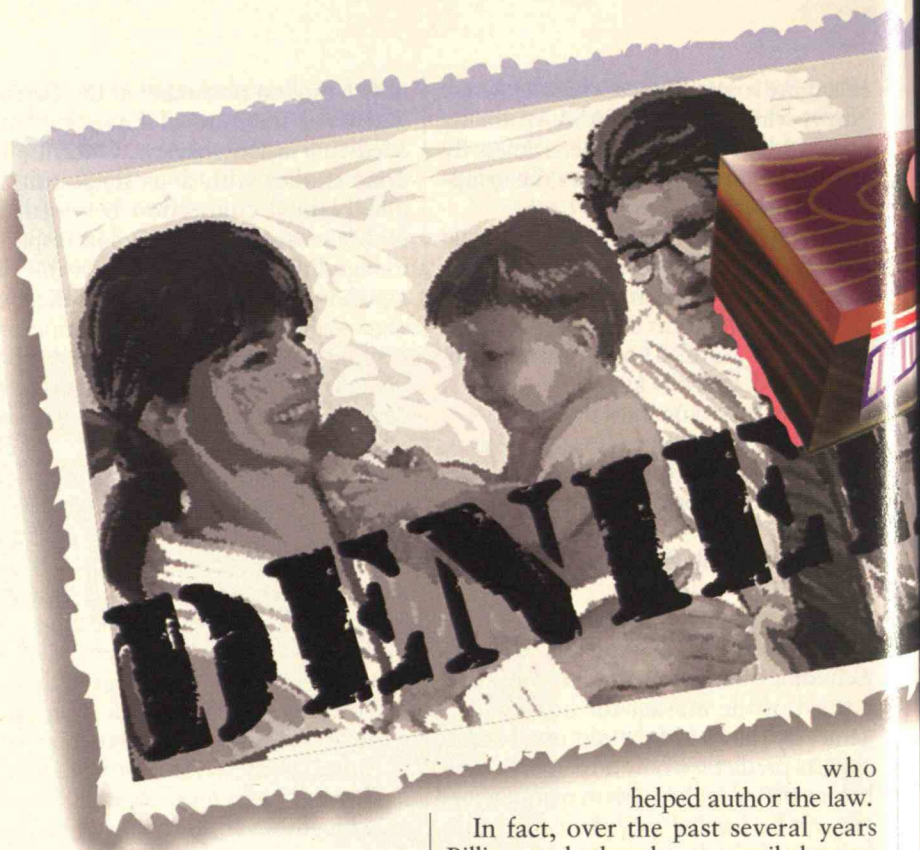
### Reducing Lag Time

And some applications are more likely to create sicknesses than others—for example, anything with lots of unexpected changes in motion and body placement. Unfortunately, it is just these sorts of movements that give games their kick. "If you adjust too many parameters and too many people get sick it is a bad ride, but if you make the realism factor too low and people don't get sick, then it's also a bad ride," said Biocca.

Finally, some people think that ever-increasing computer power will prove the salvation of virtual reality. If the lag time can essentially be reduced to zero, so should the sickness. "We don't get sick in the real world, so if we had complete fidelity, we wouldn't get sick in the virtual world," says Malcolm Cohen, a senior scientist with the NASA Ames Research Laboratory, which builds and tests simulators.

But less sanguine researchers point out that time lag may not be entirely responsible. For example, a number of unlucky fliers get airsick on even the smoothest flights, perhaps because of the discordance between sitting still and, say, watching the rapid motion of clouds out the window, which suggests that a significant subset of virtual reality users will always get sick, too.

—STEPHEN STRAUSS



## Preventing Genetic Discrimination

**I**n California, it is now a matter of state law: you cannot be considered sick until you exhibit symptoms. The pathbreaking legislation to legally designate the onset of illness is not as silly as it may sound. Rather, proponents say, it is necessary to prevent insurance companies and employers from unfairly discriminating against people on the basis of information about their genetic makeup or that of their families, even though they are completely healthy.

Because hundreds of tests are now available to identify an individual's genetic predisposition to rare inherited disorders, and dozens of others are in the pipeline to predict more common illnesses, protecting this new class of potential victims, "the asymptomatic ill," is becoming more urgent, says Paul Billings, a San Francisco-based physician

who helped author the law.

In fact, over the past several years Billings and others have compiled scores of cases of healthy individuals at risk of developing inherited conditions who have been denied health insurance. Women giving birth to babies diagnosed before delivery with genetic disabilities have had to fight for coverage. Even people with hereditary disorders already successfully treated have been refused policies. In all such cases, the lack of insurance threatens to curtail access to health care and leave the individuals financially vulnerable to huge medical bills, whether for the inherited disorder or any other.

Daniel Keife, a controller at the James Jones Co. outside Los Angeles, was rejected from his firm's health-insurance policy because he and his son carry a gene for the disfiguring and potentially lethal condition known as neurofibromatosis. Keife's son exhibits the disease's symptoms of multiple tumors and paralysis, but Keife himself has been spared such complications. "I could understand excluding my son," Keife says, "but if I were going to be severely affected, it would have happened by now."



In New Hampshire, the health-insurance policy of Jamie Stephenson and her family was terminated because

two of her four sons were diagnosed with fragile-x syndrome, an alteration of a

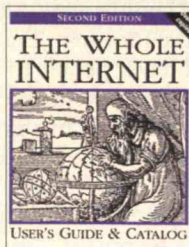
gene on the x chromosome that is associated with mental retardation. After a three-year hiatus, Stephenson says her family was recently able to get health coverage through a group policy sponsored by the National Association for the Self-Employed. But, as the coordinator of the Fragile-X Center of Northern New England, Stephenson says she continues to hear of cases in which insurance is curtailed or limited to families in which fragile-x syndrome is present.

To combat problems like these, the new California law, passed late last year, prohibits insurance companies not only from using genetic information to determine an individual's eligibility for coverage but also from setting individual insurance rates. Even for late-onset diseases like Huntington's corea or Alzheimer's disease, a demonstration of genetic susceptibility alone cannot be used to deny or curtail insurance. The law, which now affects some 20 million people in the state, covers individual and group health insurance, small life insurance policies, and group life and disability insurance. The statute also forbids doctors to release genetic test results to insurers or employers.

### Legal Loopholes

A handful of other states, including Colorado, Florida, Iowa, Maryland, Ohio, and Wisconsin, have some kind of legislation governing genetic discrimination by employers or insurance companies. But, unlike the California law, most of these laws include a gaping loophole that allows insurance companies to take the information into

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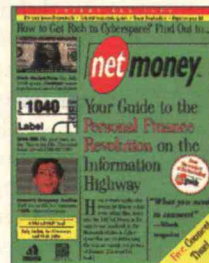
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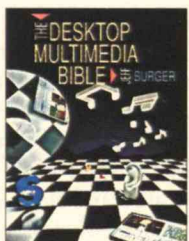


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account "if there is actuarial or claims experience" to justify its use. Such laws protect so-called carriers—people who carry a recessive gene for, but will never contract, genetic diseases such as sickle cell anemia or Tay Sachs disease. But they do little to combat the growing trend of so-called predictive medicine, in which genetic analysis is used to forecast an individual's likelihood to contract an illness.

The problem, as Billings and others explain, is that genetic conditions are variable; even within the same family, the presence of a particular gene can either predispose a person to illness or have no effect. "Whole families can be stigmatized as 'at risk' by a single test or diagnosis," Billings says, "even in the absence of actual problems."

#### A Civil Rights Issue

Proponents of the California law also argue that the costs are reasonable ones to ask insurers to bear. They point out that genetic disorders are not epidemic; the number has been stable for as long as health insurance has existed in this country.

Nonetheless, in a statistical sense, genetic tests do effectively gauge the probability that someone might contract an expensive disease in the future. As such, it is understandable that health-insurance firms would want access to the information. As Harvie Raymond, director of managed care and insurance operations at the Health Insurance Association of America in Washington, D.C., maintains, the principle is that "he who assumes a risk should have the opportunity to evaluate that risk."

Raymond, whose association represents some 240 health-insurance providers, stresses that the industry does not seek to have genetic testing done. But if such tests have been conducted, he says, it is unfair to insurance providers if individuals are privy to information about their potential health conditions that might cause them to buy added coverage while the firms are denied access to the information. He warns that laws like the

one in California "could create a great deal of havoc in the industry, causing costs to go up and fewer people to ultimately be able to afford coverage."

Raymond also stresses that group health insurance now makes up some 85 percent of all health coverage, and most group health plans are now inclusive—requiring, as he puts it, "no evidence of insurability" from individual members. Although some employers have discriminated against prospective workers through pre-employment physicals—"de-selecting" people who might get sick—new regulations now phasing in under the federal Americans with Disabilities Act explicitly forbid employers from refusing to hire people because they have expensive health conditions.

Consequently, Raymond argues, it is only some 10 to 15 percent of the American public with individual health coverage who are most at risk of genetic discrimination. And even then some insurance firms have established high-risk pools that allow at least some of the people excluded from other policies on the basis of genetic information to receive coverage, he says.

Both sides of the genetic discrimination issue voiced their concerns during the debate over the Clinton administration's 1994 national health-care legislation, which prohibited such discrimination. But since the demise of the health-care bill there has been little action on this issue federally and none is likely in the immediate future. Representatives of other states, however, say they are watching the effects of the California legislation closely and predict that more states may eventually follow that state's lead.

For his part, Billings says he is pleased with the new law but stresses that more is needed. The issue, he says, is not really a medical one but a question of civil rights. "Just as we don't allow people to be discriminated against on the basis of race or sex," he says, "we shouldn't allow them to be discriminated against based on an analysis of their DNA."

—SETH SHULMAN

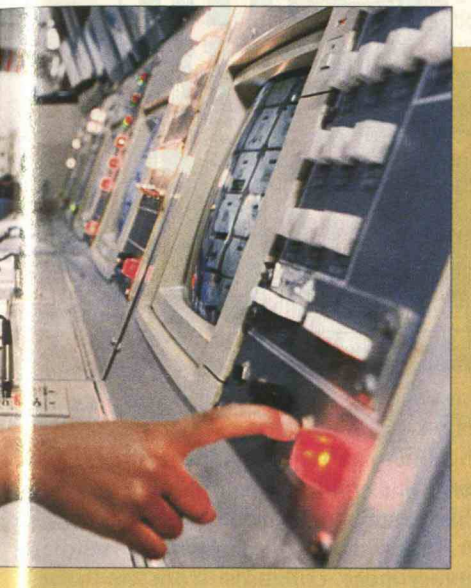


#### A 'Satellite' for Kids

It won't be quite the same as flying on the space shuttle with its resplendent views of the bluish-white earth from orbit. But a new NASA program that will allow students to see the earth through shuttle cameras they can control from their classrooms may be the next best thing.

When the first shuttle flight with the onboard cameras reaches orbit in March of 1996, students in middle schools across the country will choose which areas of earth to photograph, and the images returned to their classroom computers and television sets will help them study a variety of environmental phenomena. For example, seventh graders at Gompers Middle School in San Diego will train the cameras on the earth's bodies of water to study such events as hurricanes, plankton blooms, and erosion, says Paul Bixler, the seventh-grade math teacher who will lead the study.

The project, named KidSat, for kids' satellite, amounts to "giving students their own piece of the space program," says Sally Ride, the first U.S. woman in space and creator of the program. Now a physics professor at the University of California at San Diego (UCSD), she sold the concept to NASA's hierarchy and the



agency's Jet Propulsion Laboratory in Pasadena, which will manage KidSat, as a means to interest youth in mathematics and science. "Students are so enthralled by the space program that you can teach them lots of things—for instance, math to calculate shuttle orbits and geography to choose targets—almost without their knowing it," she says.

Frank C. Owens, director of NASA's educational programs, agrees. "The agency adopted KidSat as a new way to promote science education," he says. "As students study math and science, they will see there are real-world applications."

Students and their teachers will send their requests for shots of oceans, rivers, forests, or other land features over the Internet to UCSD, where a team led by Ride will forward them to Houston for relay to the shuttle along with the normal stream of communications to the ship.

On board the shuttle, a digital still camera built by Kodak will be positioned in the top window of the crew compartment. The camera uses a charge-coupled device that electronically senses light and converts it into digital codes that will be stored in an IBM Thinkpad laptop computer. When the data are radioed to earth, along with the shuttle's normal stream of information about the

NASA's KidSat program will allow students to control cameras aboard the space shuttle and enable classrooms linked to the Internet to conduct longer-term studies. Like the U.S. Space and Rocket Center's popular Space Camp program (left), which offers week-long sessions, KidSat aims to boost student interest in math and science.

status of its systems and astronauts, the images will be checked at UCSD for quality and then sent over an Internet computer link to the middle school requesting them—and any other school that taps in—for viewing.

A video camera like those now used on shuttle missions will operate from the shuttle's cargo bay whenever the bay's doors are open, delivering a live feed to NASA's Johnson Space Center in Houston. The center will distribute these images on NASA's satellite television channel to participating classrooms and any others with a satellite-receiving dish.

At UCSD, students are writing software to accomplish the transactions. And a campus lab, which will become the control center for the KidSat missions, is being equipped with Alpha workstations from Digital Equipment Corp. like those being installed at Johnson Space Center.

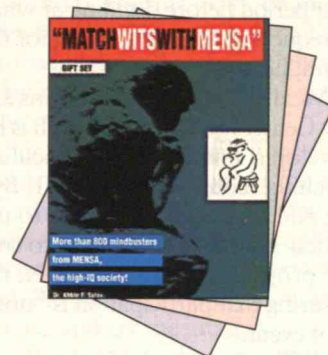
Students can already develop experiments to ride aboard the shuttle, perhaps testing the effects of weightlessness on living creatures or materials. But such projects are difficult and expensive to build and require extensive supervision, so involvement is usually limited to a small number of students.

While only a few schools in California, South Carolina, Nebraska, Maryland, and Texas will be involved in KidSat initially, perhaps 100 more will take part within two years, says Michael Wiskerchen, who administers the program at UCSD. Hundreds of additional middle schools are expected to participate within a decade if funding is available from the agency.

NASA is hoping to begin the program on a slim budget of no more than \$1 million annually for the first three years,

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says Owens. But given increasingly stringent congressional budget reviews, the agency will likely wait until the end of that period before deciding at what level to request continued funding for the program, he says.

Meanwhile, Johns Hopkins University Center for Talented Youth is helping develop a standardized curriculum and teaching materials for KidSat. By making KidSat easy for teachers to use and widely available, Ride hopes to ensconce the project in school curricula, thereby ensuring that participation is "not a one-shot event."

KidSat organizers also hope to make the program a more permanent fixture by eliminating reliance on the shuttle itself, which flies infrequently and for short periods. "We'd like to have an imaging station in space that kids can have continuous access to," Wiskerchen says. In fact, NASA has expressed interest in putting KidSat cameras on a U.S. space station, when and if one is built after the turn of the century.

In the interim, Ride thinks Russia's Mir Space Station would be an ideal home for KidSat cameras. The shuttle could transport the cameras during any of its several scheduled dockings with Mir starting this year. Students could then gain an astronaut's view of the earth virtually anytime. Images also could be beamed to Russian schoolchildren, if that nation chose to participate, she says.

While the realities of KidSat may be dazzling enough for most, virtual-reality technologies now available could make possible an even more spectacular panorama. A student could don a viewing helmet and establish a real-time computer link with the shuttle through the UCSD mission control center. The camera's images would appear three-dimensional, and each time a student turned, the onboard camera would follow. "Students would think they were actually sitting in the shuttle bay and looking back at the earth," Wiskerchen says. That might qualify as the best science field trip yet.—DAVID GRAHAM

## Telecommuting: Preparing for Round Two

Telecommuting is the technosocial megatrend that never happened.

The vast majority of us continue to go

about our business the old-

fashioned way, to

and from the office by car,

train, bus, or subway, five days

a week. And yet practically everyone

knows someone who telecommutes, or more probably someone who *used* to telecommute. Indeed, the irony is that just as the technology has become good enough and cheap enough to allow enormous numbers of people to work from home, there is more frustration than ever among both employees and managers.

Consider a typical telecommuting scenario. Baby-boomer mom wants to spend more time at home with her children but without sacrificing her career in the process. So she proposes to her boss the idea of working from home a few days a week. Because mom is a highly valued employee, the boss agrees to give it a try, albeit reluctantly. It will be a provisional arrangement, he explains, a trial of sorts, subject to termination at any time.

Mom sets up her home office. Because she is so motivated, things work out splendidly: she greatly appreciates the break from commuting and the opportunity to be close to her kids, and she finds that she is even more productive at home than at the office. The boss is happy too, and the special arrangement continues—but not for long.

Even though boss and mom agree to keep this special schedule discreet, since no official company policy exists on the matter, the arrangement inevitably catches the attention of other would-be telecommuters. Soon a half-dozen other moms, including some less-than-stellar performers—and even a few dads—ask their bosses for this accommodation as



well. Several colleagues

without children grumble that they'd like to stay home, too.

In a matter of months the whole experiment collapses from its own weight. The company decides that the chaos created by letting anyone work at home any time would be unmanageable, and the special arrangement with mom abruptly ends.

Such dramas have been played out in countless firms around the country. And as a result, the telecommuting movement, at least temporarily, has stalled. The underlying problem, according to Frank Becker, director of the International Workplace Studies program at Cornell University, is that most companies begin offering telecommuting as a special accommodation for a few select employees, typically young parents. But "doing the employee a favor" is a precarious foundation at best. Ultimately, such a policy is not in the best interests of the employee, manager, or company at large because it is, by definition, unfair. There have to be far better reasons for letting employees work from home, he says.

And in fact there are. Reducing overhead costs is an obvious one. Many billions of dollars are poured into creating corporate quarters. Maintaining these monuments is also expensive. In fact, the annual rent for one square foot of office space in major U.S. cities can easily exceed \$25 per square foot. Thus, if a company could cut its office space requirements by sending employees

home to work, it could reap huge savings

Perhaps an even better reason to have employees work from home is that telecommuters appear to work more effectively and efficiently than their office-bound counterparts. "We're not just talking about a performance boost from a company's best employees," says Maggi Payment, director of the San Diego Center for Worktime Options, a telecommuting consulting and training firm. One recent pilot program Payment was involved in proved that allowing employees to work without the distractions of the office could lead to productivity gains among any group of individuals, even those identified by their managers as being the *worst* employees.

Unfortunately, most managers balk at the prospect for fear they will lose control when their employees are not close at hand. "It's telling," says Becker, "when you hear managers say, 'If this guy is working at home, I won't know if he's really working.' What's interesting to ask these managers is, 'How do you know your people are working when they are at the office?'"

From the perspective of these managers, then, it appears that Woody Allen was right: 80 percent of life really is just showing up. "We need to stop focusing on whether Tom came into the office at 8:00 and went home at 6:00," Becker says. "The question should be, 'Did Tom do what was expected of him over the course of the week or the course of the project?'"

Still, from the employee's perspective, along with the flexibility and freedom of telecommuting comes a large share of uncertainty and fear. When you go to the office, you dress a certain way, you behave a certain way, and you hardly ever think about it, says Payment. At home the seemingly trivial is suddenly a problem. How do I dress, how do I act, how do I convince people—especially me—that I'm really working?

At the office, says Becker, you answer the phone, "Accounts receivable, Peterson speaking." Does that change when you are at home? At the office you do a few errands during lunch, but at home

what are the restrictions on running to the dry cleaner, grocery store, gym, or barber? And if you do go out, do you let your six-year-old take a message for you? Do the hours in which you're available expand because you work from home?

"Such details can overwhelm telecommuters and undermine many good efforts," says Becker. Thus, ground rules for such work should be as explicit as the expectations about employees' performance. "There should be no guesswork, no 'unwritten rules' when it comes to telecommuting personnel policy," he says.

### Business Incentives

Even if considering only the bottom-line perspective of cutting overhead, Becker says, a company must devise a plan. It makes no sense for a firm to have employees work at home two or three days a week and allow their offices back at headquarters to stand empty. And yet that is exactly what often happens.

Companies instead need to devise configurations that cater to a mobile workforce. Some firms may rotate offices or use open workstation modules. Some may even want to establish "telework centers" so that small groups of employees who happen to live in the same suburb can report to work near home rather than commute all the way to headquarters downtown. Still others may rent work space and equipment at local business centers, such as one nationwide chain called Kinkos, which encourages business people to "think of us as your branch office."

Even though telecommuting poses some challenges and is taking a long time to arrive, it is a trend that can't be denied, predicts Payment. She points to a recent study by Link Resources, a market research and consulting firm for small and home businesses, which shows that the ranks of telecommuters are expected to swell by 10 percent to 9.2 million by the end of the year, and see higher double-digit growth through 1998.

But this time the push may come not only from employees. Indeed, some

observers estimate that at most 20 percent of workers even want to telecommute. Many who try it quickly return to the workaday routine, says Payment, when they realize how much discipline it takes to avoid the call of the refrigerator, the television, the lawnmower, or the washing machine.

Rather, the impetus will now come from corporations because of the economic advantages. Telecommuting not only cuts overhead, but when people are contracted to deliver specific information services, Payment says, they do more, at lower cost, and get the job done on time because they are directly responsible.

"Whether you label this movement the 'de-jobbing' of America or the rise of the contingent workforce," says Payment, "the whole concept of employer/employee relations is being turned on its ear by competitive pressures and technology." Whereas a generation ago information resources were the domain of large companies, she says, today that power can be wielded by individuals.

Though some may view telecommuting with trepidation, from a cultural perspective, it suits us, observes Peter Schwartz of the Global Business Network, a strategic planning consortium in Emeryville, Calif. It's very hard for this movement to occur in the more collectively oriented societies in Europe and Asia, which until quite recently followed strong feudal models, he says. "But in our rugged-individualist society, the virtue of the independent employee is a powerful force."

Schwartz points to the U.S. dominance in the computer market as an example. "The reason for our success is that the field lends itself to small entrepreneurs," he says. "The most competitive computer industry in the world was created because of our social system, not the other way around." On the other hand, as the American philosopher of pragmatism John Dewey observed some 75 years ago, "rugged individualists" tend to become "ragged individualists." For telecommuters, disproving this progression might be the greatest challenge of all.—DAVID BJERKLIE



# *Resisting AIDS*

## *ANOTHER VACCINE APPROACH*

BY GENE M. SHEARER AND MARIO CLERICI

*I*N 1990, our team at the National Cancer Institute decided to study a group of people who showed no traditional signs of infection by HIV, the virus that causes AIDS, even though they were clearly at risk. Blood results from the 115 group members—including gay men, intravenous drug users, newborn infants of infected mothers, and health care workers accidentally exposed, in most cases by a single contaminated needle stick—did not show HIV antibodies, the standard indicator of infection by that virus. We knew that the body can respond to an infection by producing antibodies that directly target an invader that is found in fluids such as blood or mucus. But we also know that the body can produce a “cellular” response, when it finds that some of its own cells are infected and are providing a hiding spot for the invader. In that case immune cells known as killer cells will recognize and destroy the very cells infected with a virus such as HIV. In other

*Have past efforts to develop an AIDS vaccine been based on the wrong idea? Research by the authors and others suggests a different avenue, one that might also change the approach to treating a variety of medical problems.*

words, the body has a mechanism by which it will sacrifice part of itself to protect the greater whole.

In the group we were studying we therefore looked for evidence of a cellular response to HIV infection. To our surprise we found that between 35 and 65 percent of various subsets of our participants exhibited evidence in their white blood cells of such "cellular immune activity." Only 3 percent of the members of a control group of individuals that we presumed had not been exposed to the virus showed such a response.

It is possible that some people in our test group may never have been infected with the whole virus, but were exposed only to select viral proteins that can elicit cellular immune activity. Another possibility, however, is that whole HIV infected these individuals and they had so far controlled the infection to the extent that it was not detectable by traditional means. There is even the chance that some of the individuals may have destroyed the virus.

Evidence suggests that at least some participants in studies like ours have indeed controlled infectious HIV. Consider 1993 research by immunologist Pierre Langlade-Demoyen and co-workers from the Pasteur Institute in Paris, which involved people with no evidence of antibodies to HIV but who had engaged in unprotected sexual activity with individuals known by traditional testing to be infected. A small proportion of the study group showed not only a cellular immune response to HIV but also evidence of the virus in white blood cells, according to a sensitive test that can detect genetic components of the virus in the genetic material of infected cells. We independently found similar results in 25 percent of a small group of HIV-exposed gay men: they had cellular immune activity and evidence of infection by the genetic test, but did not produce HIV antibodies. Periodic follow-ups over three years indicated that these people did not start making antibodies to HIV despite repeated exposure.

Another hint of a protective mechanism against HIV comes from two continuing studies, led by Francis Plummer, an epidemiologist from the University of Manitoba in Winnipeg, and Sara Rowland-Jones, an immunologist from Oxford University in Great Britain, of prostitutes in Kenya and the Gambia. Plummer's

research indicates that prostitutes are less likely to produce HIV antibodies over the long term if they do not make them for the first two years after entering the business, in which unprotected sex often occurs. Meanwhile, the majority of the women who appear to be protected from AIDS exhibit cellular immunity to HIV, according to both studies.

We decided that such results cried out for efforts to determine whether an AIDS vaccine should rely on the body's cellular immune response rather than the antibody response. A series of experiments that we and others have conducted since our initial findings suggests that this idea—which is controversial—should be seriously considered.

### *How the Immune System May Fight HIV*

Much of our research revolves around cytokines—proteins that regulate the immune system—that are made by white blood cells of HIV-infected individuals. Several laboratories, including ours, have observed changes in the kinds of cytokines produced before a person testing positive for HIV antibodies progresses to full-blown AIDS. We have found that production of the type of cytokines that mainly promote a cellular immune response drops before a person develops AIDS, while production of the type of cytokines that primarily enhance an antibody response can rise during this period. We refer to this as the "type 1-to-type 2 shift"; the cytokines responsible for a cellular response (they stimulate the development of killer cells) are known as type 1 while their counterparts responsible for antibody production are called type 2. Immunologists Timothy Mosmann at the University of Alberta in Edmonton and Robert Coffman at DNAX Research Institute in Palo Alto, Calif., and their colleagues were the first to demonstrate this effect in mice, in the mid-1980s.

(Not all scientists who have tried to reproduce our work have found a type 1-to-type 2 shift. Using a slightly different testing method, Anthony S. Fauci, the director of the National Institute of Allergy and Infectious Diseases, did not verify our findings.)

We have also found that most of the HIV-infected people who progress to AIDS in a relatively short time produce more type 2 cytokines, whereas those who remain without major symptoms of AIDS for at least 10 years—the so-called long-term nonprogressors that the

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general media described in a number of stories earlier this year—produce far more type 1 cytokines.

Given these findings, we suggested that testing whether the cellular component of the immune system protects against AIDS was sensible. Since that research would require injecting individuals with HIV—something we cannot ethically do with people—we turned to the macaque monkey. We can inject that animal with a related virus, simian immunodeficiency virus (SIV), which induces a syndrome that in many ways resembles HIV infection and progression to AIDS. In a study with Raoul Benveniste, a virologist at the National Cancer Institute and colleagues at the University of Washington Primate Center in Seattle, one group of animals was injected with a very low dose of SIV, approximately one one-hundredth that necessary to indicate infection by PCR, the sensitive test that detects genetic components of SIV in the material of infected cells. A second group was left alone. Sixteen months later, researchers inoculated both groups of animals with about 10 times the amount of SIV required to detect infection using PCR. The animals in the second group showed evidence of infection by antibody and PCR tests, and these macaques eventually developed AIDS-like symptoms. But the first group did not show any such evidence of infection—and did not go on to develop the AIDS-like illness.

Moreover, approximately one year after the high dose of SIV, blood samples from the second group of monkeys did not show a cellular immune response to SIV, but blood samples from the protected group did. These findings, supported by a similar experiment performed by virologists David Pauza at the University of Wisconsin and Shiu-Loc Hu at Bristol-Myers Squibb in Seattle, support the suggestion that the cellular arm of the immune system provides protection against AIDS, and by analogy possibly even HIV infection.

### *Setting the Stage for AIDS*

**I**f an antibody response offers less resistance to AIDS than a cellular immune response does, we can make some predictions concerning people exposed to HIV following other diseases. Certain infections cause the immune system to undergo a type 1-to-type 2 shift as it battles them. André Capron and Jean-Claude Ameisen, infectious-disease experts at the Pasteur Institute in Lille, France, have reported,



*A hint of a protective  
mechanism comes from studies of  
prostitutes in Kenya and the  
Gambia who test negative for  
HIV antibodies two years  
after entering the business.*

for example, that people infected with the parasitic worm *Schistosoma mansoni* tend to undergo a shift toward producing mostly type 2 cytokines and antibodies. The antibodies appear to protect against further infection by that parasite.

Imagine what could happen if an invader best fought by a strong cellular immune response entered the body at the same time or shortly after the body has shifted to a type 2 response. The second intruder might be able to infect the host easily, possibly even at low doses that the individual might normally resist.



**W**e believe that a vaccine  
that gears up the "cellular  
immune response" and stops  
HIV from causing AIDS  
may be better and more realistic  
than one that prevents  
infection altogether.

We and other researchers, such as Luc Montagnier, a virologist at the Pasteur Institute in Paris and the codiscoverer of HIV, and Zvi Bentwich, an infectious-disease expert at Kaplan Hospital in Rehovot, Israel, have therefore speculated that cofactors may play a role in AIDS. If someone has been infected with an agent that induces a strong type 2 response before he or she comes in contact with HIV, that person might be more susceptible to HIV infection and progress to AIDS faster than

someone not so infected initially. The population in countries where parasitic infections such as schistosomiasis are prevalent might be less resistant to AIDS. The same might be true for people who have recently had other infections that induce a type 2 response, including syphilis and measles. Infants, too, might be particularly prone to AIDS; people don't develop strong type 1 responses until they are approximately one year old.

### *New Approaches to Treating People with HIV*

**T**he notion of a type 1-to-type 2 shift in most people infected with HIV is prompting researchers to test the idea of treating people in new ways: with type 1 cytokines, with other molecules that cause the body to raise its own production of type 1 cytokines, or with antibodies to type 2 cytokines. Some clinical trials have already started administering two type 1 cytokines, known as IL-2 and IL-12, to HIV-infected individuals, and researchers are planning other tests. In early results from one small, uncontrolled trial with IL-2, 6 of the 10 patients who at the start had undergone the least progression toward AIDS showed elevated levels of CD4 cells, which are responsible for the cellular immune response and which are depleted in AIDS patients, according to Clifford Lane, the scientist at the National Institute of Allergy and Infectious Diseases in charge of the research. This cytokine therapy did not work as well in patients who, when the study began, had advanced further toward full-blown AIDS.

While people should not rush to conclusions about these initial findings, since there are also possibilities of side effects and future problems caused by cytokines, the research might suggest new perspectives on AIDS vaccines. A major effort against AIDS has focused on designing vaccines that elicit antibodies so that HIV cannot infect the body. But while many antibodies developed for this task neutralize HIV strains studied in the laboratory, these antibodies do not kill many HIV strains isolated from infected patients, probably because of HIV's rapid mutation rate in humans.

We believe that a vaccine that gears up the cellular immune response and stops HIV from causing AIDS may be better and more realistic than one that prevents infection altogether. (Some vaccines are designed to control or stop an infection in progress instead of to prevent an initial infection.) After all, killer cells, a major type

of immune cell that type 1 cytokines stimulate, control infection by destroying virus-infected cells.

Researchers are now testing candidate AIDS vaccines that aim to enhance cellular as well as antibody immune responses. Stimulating both arms of the immune system at once may not be easy, however, since the conditions for optimizing each response vary with factors such as the vaccine dose, the method of immunization, and additional material used to boost the immune reaction. At least some efforts to design an AIDS vaccine need to focus exclusively on cellular immune activity.

### *Beyond AIDS: Cancer and More*

Findings about cellular and antibody immune responses to HIV are also prompting questions about whether some classic autoimmune diseases wreak damage because of a type 1-to-type 2 shift. Researchers in our laboratory and elsewhere have recently observed such a change in patients with the autoimmune disease systemic lupus erythematosus, in which antibodies attack afflicted individuals' kidneys. These patients and others suffering from certain autoimmune diseases might benefit from treatments similar to those we have mentioned as possibilities for combatting HIV, such as type 1 cytokines.

We have also recently found that certain cancers—Hodgkin's disease, which affects lymph tissue, and prostate cancer—are associated with reduced cellular immunity, much as we observed in HIV-infected individuals. Although not all cancers follow this pattern, we are now testing groups of patients with melanoma, breast, cervical, or bladder cancer. An important question is whether cytokine shifts result from the cancer or precede tumor development. If the latter, an old speculation that the immune system plays a role in preventing or destroying new tumors might be correct, and researchers might place more emphasis on cancer therapy that focuses on immune activity.

Growing information on cytokine shifts should also lead to a variety of improved vaccines, particularly those given to infants, since their immature immune systems do not produce high levels of certain type 1 cytokines. Consider how in one measles-vaccine program designed for infants in developing countries, researchers thought they might improve protection rates by administering greater-than-usual amounts of live virus, crippled so as to prevent measles transmission. Tragically, many of the

children in the trial became ill with other infections, and several died. Diane Griffin and Brian Ward, virologists at the Johns Hopkins University, later realized that immunization with live measles vaccine can induce a type 1-to-type 2 cytokine shift. Although this loss in cellular immune function is usually short-lived, it can last up to two years, and, as suggested by Maurice Hilleman, director of therapeutic research at Merck Research Laboratories in West Point, Pa., probably made the infants susceptible to other infections.

The medical community also might want to re-evaluate the success of vaccines such as those given to protect against influenza. Doctors now rely on an antibody-mediated protection scheme for the flu, a system that requires the development, distribution, and administration of altered flu vaccines every year, since, like HIV (though on a lesser scale), the virus mutates. This vaccine strategy involves considerable planning and expense. (And individuals can come down with the illness each year that they fail to get flu shots.) If researchers developed a flu-vaccine strategy based on those parts of the virus that the cellular immune response recognizes and that do not mutate, people might not need annual revaccinations. Immunologist Margaret Liu and her team at Merck Research Laboratories have suggested that although such an approach might not prevent initial infection, it could result in relatively short illness with few symptoms. The cellular immune response could rapidly and efficiently destroy the virus and might protect the body from further flu infections.

These research areas are tantalizing and well worth pursuing. But given the crisis presented by AIDS, the need to apply the findings on cellular immune activity to vaccine research concerning HIV is particularly great. For the past five years we, along with Jonas Salk, who introduced the first polio vaccine 40 years ago, have suggested to our colleagues that the strategy of developing an antibody-based AIDS vaccine is misdirected. Even the current plans to try to optimize both arms of the immune system could be problematic, for if, as we have suggested, such an approach does not work, the research community might abandon the goal of an AIDS vaccine altogether. Since studies strongly indicate that a cellular immune response may provide immunity against AIDS, researchers need to devise vaccine trials that emphasize such a response. We owe that to the millions of people whose lives have been or will be cut short by this disease. ■

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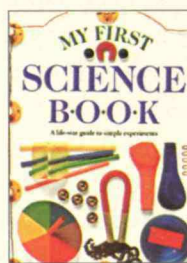


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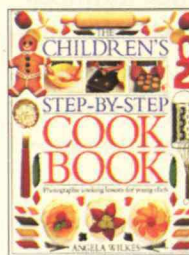


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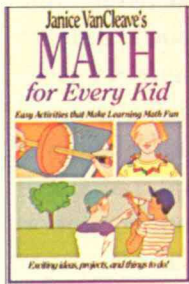


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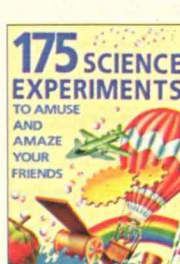


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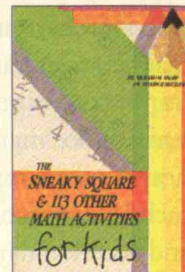
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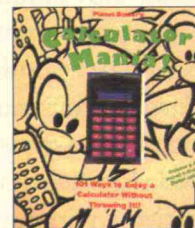


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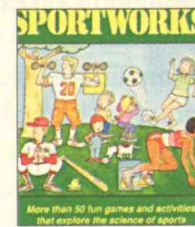


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by the Ontario Science Centre  
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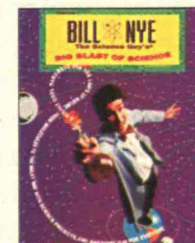


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Ages 10 - 14, Paperback, 171 pages, \$12.95



# Home Is

BY PERRI KLAS



“They’re going to cut off my electricity,” Donnie’s mother said. “Will you call them for me, doctor, and tell them there’s a sick child in my house?” ☽ It’s not such an uncommon request. Will you get them to turn on my gas? my electricity? my phone? Tell them my little girl has asthma, we might need to call the doctor. Tell them I need the stove to make my baby’s formula warm; he didn’t gain weight so well, and he needs his formula the right temperature. ☽ And, like most pediatricians, I am generally willing to oblige, even if at times I do wonder just what all

the calls are on that phone bill I am helping

to excuse. I’ve been involved with

the occasional family that I felt

was taking advantage of me,

getting me to call again and

again to get them out of pay-

ing bills that they could per-

fectly well have managed to

pay, pleading the not-very-serious

illness of a child as an excuse for adult

selfishness and bad management. But most of the time,

my main feeling is that children, sick or well, need warm

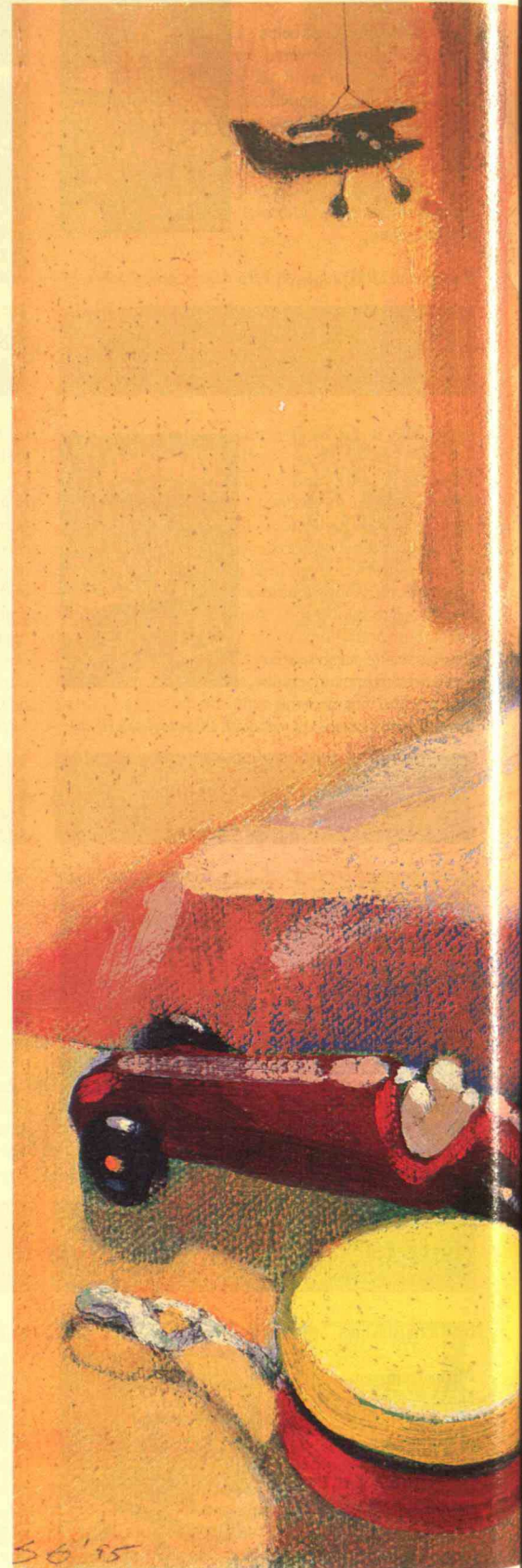
houses and cooked food and, yes, access to a telephone—

and I make the calls and write the letters.

*Ironically,*

*it’s sometimes easier  
to arrange for the use  
of sophisticated home-  
medical technology than  
to make sure patients have  
the electricity to keep  
it running.*

ILLUSTRATIONS BY SHELDON GREENBERG



# *Where the Heart Monitor Is*



*For many parents, access to the same medications and equipment used in hospitals means a new sense of strength: now there's something they can do when their child gets sick.*



Donnie was something of a different story. I called the electric company. "If you cut off the electricity to this family," I said to the supervisor, "a child will die." In a certain way, I even enjoyed the drama of the call; it's not so often in primary care pediatrics that you get to invoke Life and Death. Well, the people on the other end sounded a little suspicious, but they didn't turn off Donnie's electricity. So his cardiorespiratory monitor kept beeping, his nurses and his mother had suction available if his tracheostomy tube got clogged, the pump that infused liquid nutrients into his feeding tube kept churning, his home nebulizer kept on blowing out vaporized medication into the air in his room to keep his lungs from spasming—oh, and the lights stayed on in the house, so it was possible to see if his lips turned blue at any point, or if he started to regurgitate his feeding and choke.

A decade or two ago, Donnie would have been in a chronic-care institution, a hospital for people who are not likely to get better—that is, if he had survived at all. Donnie was a very premature baby born eight years ago, one who suffered just about every complication in the book. He has seizures, cerebral palsy, severe lung disease, a gastrointestinal tract that doesn't work very well, and myriad other problems.

On the plus side, when he's feeling ok, he's a smiling, happy kid who is affectionate and eager to be cuddled. He understands a large number of single words and simple sentences and when he recognizes faces reveals an unmistakable grin. And he's cared for at home by his mother and a rota of nurses, who administer his many medications (usually through his feeding tube), suction excess secretions out of his tracheostomy tube, check the oxygen content of his blood, help him with physical therapy exercises to keep his joints from stiffening, take tender care of his skin to prevent bedsores, and, of course, talk to him, sing to him, play games with him.

Taking tender care of an invalid at home is nothing new. Nurses coming into the home are nothing new.

What is new, what makes Donnie different from the invalid of 20 years ago, is the array of technology that keeps even someone as sick as he out of the hospital. The very devices that I was worried would cease to function if the electricity was cut off are those that would once have been restricted to a hospital or nursing home.

Donnie makes an interesting example because he is not the child of an educated, entitled family, ready to assume the prerogatives of the medical system, learn the vocabulary—go to medical school the hard way, as we say. His mother is a single parent, with limited education, a woman without the means to pay her bills on time. She loves her son dearly, but she has never mastered his medication schedule. When he gets sick, and she takes him to the clinic, she brings along one of the nurses, who in turn brings along the big binder in which the nurses keep their scrupulous notes about Donnie's condition, medications administered, blood oxygen readings. Donnie's mother would never open that book, cannot answer any medical questions. Her electricity cut-off emergency juxtaposes in my mind images of cutting-edge home technology, monitors beeping, digital readouts on infuser pumps, with the human factors of planning, plugging in, and paying the bill.

#### GIVING PARENTS POWER

Donnie doesn't even require the most extreme degree of home technological support. He has a tracheostomy tube, but he isn't on a ventilator—and a person can be at home on a ventilator. All the various ventilator settings—respiratory rate, breath volume, oxygen content—can be regulated at home. And a ventilator, after all, is the ultimate life-and-death machine; if it fails to function properly, the person does not breathe.

Donnie gets his medications and his feedings through a tube implanted in his stomach, not through a surgically inserted intravenous line—but there are lots of people at home with these so-called central lines. They're far more complex to care for than the gastrostomy tube; a line that leads right into a big central vein,

PERRI KLASS is a pediatrician in Boston and the author of several books, including *Baby Doctor: A Pediatrician's Training* (Random House, 1992).

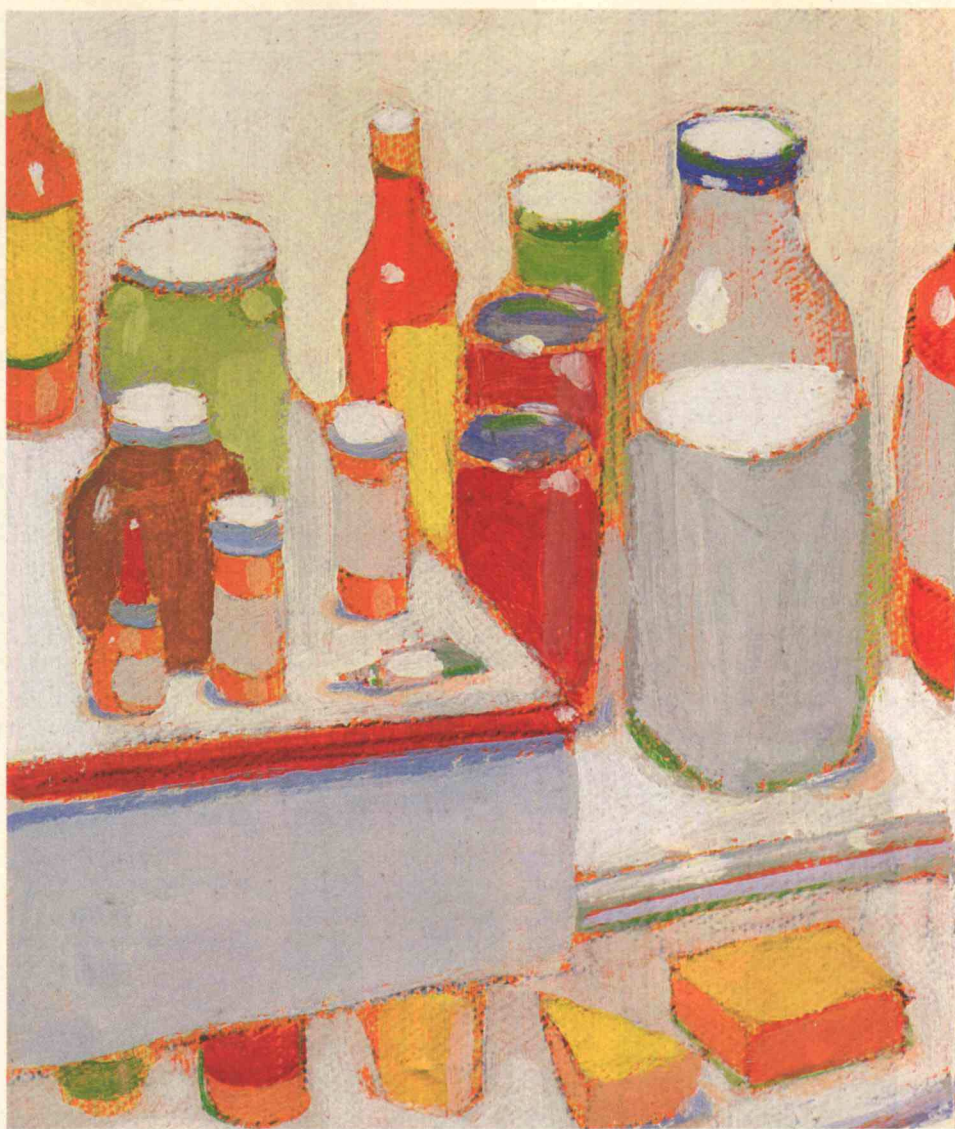
after all, is a breach, through the skin, of all the body's most sterile defenses. If bacteria get in (and they do), terrible infections of the line, the bloodstream, or the heart muscle can result. So central lines require sterile technique, scrupulous monitoring of drug and fluid dosages, more complex infusion pumps.

I can remember, when I was a resident, getting told off very sharply by a mother in the emergency room; she felt that my sterile technique, when I went to draw blood off her son's central line, was not nearly meticulous enough. Get away from that line, she basically told me. Hands off. Let me show you how it's done. And she did.

The push to move more and more technology into the home has come partly from family members who want to take care of their own, and partly from the rising costs of hospital care. If a child needs several weeks of intravenous antibiotics, but is otherwise well, it's much cheaper to pay a visiting nurse to come and administer the drug in the home than to keep the child in the hospital. Obviously, it's cheaper for a child with severe asthma to have a nebulizer at home and get medicine that way whenever the wheezing starts than to have that child come to the emergency room when things finally get so bad that there's no alternative.

Home nebulizers are the technological support I prescribe most frequently. They deliver the asthma medications directly to the lung muscle where they relax the constricted airways and relieve the wheezing. There are children who get three nebs a day, and others who just get one every now and then when something—a change in the weather, a respiratory infection—sets off the asthma. It's a kind of yielding up of power, giving the parents the same device, the same medications that we use when sick children come to the clinic or the emergency room. Like it or not, when we demystify the technology, parcel it out into people's living rooms and kitchens, we are giving up some of our power and exclusive mumbo-jumbo.

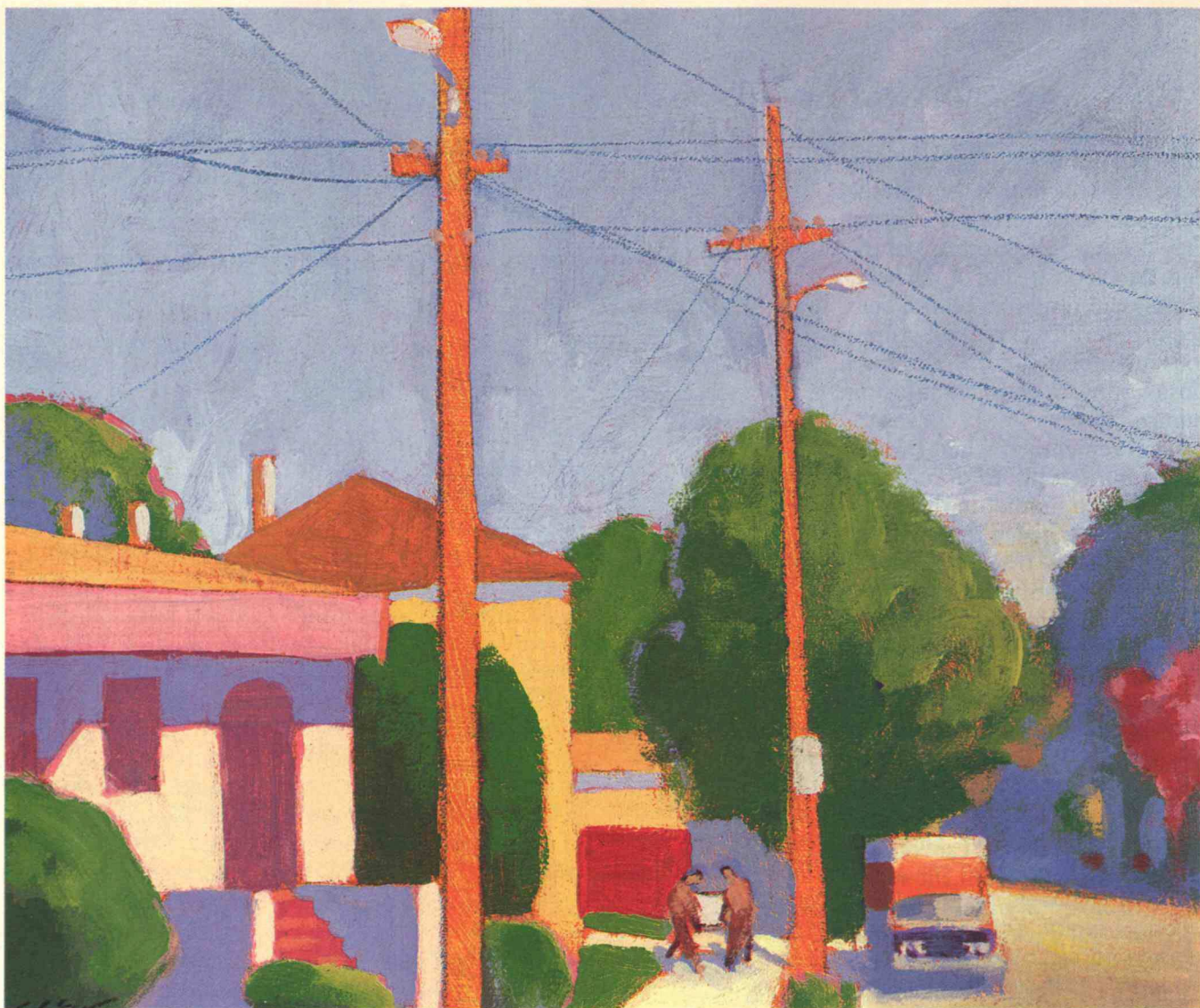
It's only a device you plug into the wall to spray some of this medicine into your child's face. Yet for many



parents, this means a new sense of strength and resourcefulness: there's something I can do when he gets sick. Instead of watching anxiously to see whether he's wheezing so badly he needs to go to the emergency room, I can watch to see whether he needs a neb—and give it to him if he does. I can judge my child's respiratory status as well as any doctor—and now I can treat it as well as any doctor, too.

#### MONITOR PATHOLOGY

But then consider another relatively common piece of home technology: the apnea monitor for the child who is considered, for one reason or another, to be at risk for sudden infant death syndrome (SIDS). One of my patients, Lucy, was brought into the hospital when she was five months old by a terrified mother who thought she saw the baby choke and start to turn blue right after drinking from a bottle. The mother was sure the baby was dying, and started to give her mouth-to-mouth resuscitation, while



the father raced to a phone to call for emergency help.

When the ambulance arrived, the baby was pink and awake and vigorous. She spent three days in the hospital, being observed, a monitor tracking her every breath and heartbeat. No choking spells, no slowing down of the heart rate. A neurologist examined her, listened to the mother's story, and said it might have been a seizure. So Lucy got a head CT and an EEG, both of which were normal—no evidence of seizure activity, no evidence of brain abnormality.

The problem was, the story the parents told was just a little too real. And they had two older children, so they weren't terrified first-time parents by any means. If they said something had happened, something outside the normal realm of baby spitting and choking and burping and urping, then probably something had. And if Lucy had had some kind of unexplained "episode," then wasn't she at risk for another?

What Lucy's parents wanted was a monitor. I'll never be able to leave her alone while she's sleeping unless she's hooked up to a monitor, said Lucy's mother repeat-

edly, watching over her daughter as she slept peacefully and safely in the hospital, the monitor beeping along. And eventually, Lucy did go home with a monitor, after her parents had been trained in how to respond to alarms and how to administer CPR.

All the pediatricians involved were left feeling uncomfortable, because it wasn't really clear that this "episode" had shown that Lucy was at risk for SIDS. Also, monitors have not been shown to prevent SIDS—children have died while connected to monitors. What monitors can most definitely do in cases like this one is make the whole family very anxious, reinforce the idea that there is something terribly wrong with the baby, and create a situation in which the parents are afraid to let go of the monitor, to trust the baby to make it through the night. Monitor pathology, it's been called. So here is a piece of home technology that instead of conferring power and confidence can rob parents of their faith in their own abilities to watch and guard their child, and their faith in the child's ability to go on breathing.

*People recoil when they first see a child attached to life-support devices. But such equipment soon becomes just another part of a household adjusting to a child with special needs.*



And yet, if it were your child, if you'd actually seen the baby turning blue, if you'd looked up the statistics on SIDS and knew it was not so very rare, would you feel that the monitor was robbing you of your peace of mind or that it was offering you the only technological shadow of peace of mind that you can hope for? Some families live with the monitor for a little while. Then, if the baby has no more episodes, they get sick of the constant false alarms, the reminders of doom, the wires and the beeping, and they stop hooking up the baby. Other families can't take the child off the monitor even after the age of risk for SIDS is past—it's just too scary to contemplate the child lying there defenseless, no siren to give warning if something goes wrong.

#### A WELCOME ADDITION

Some nebulizers and home monitors are devices that are often used for children who are essentially healthy. They are small intrusions of medical technology into everyday homes. Chronically ill patients, like Donnie, like the children with cancer who have central venous lines in place for their chemotherapy, like the children on home ventilators, often live in homes, or at least in rooms, that have been more completely taken over by hospital devices, by record-keeping and medical paraphernalia. These are the patients who depend on technology for the air they breathe, for their nutrition and their fluids, for the medicines that keep them alive from day to day. The machines are not reassuring extras to keep the children out of the emergency room, to keep the parents comfortable, but rather the props and stuff of life itself.

And around this home technology, as it has become more common in recent years, has grown up a large and occasionally shadowy industry to install and service and replenish, to stock the intravenous lines with plastic bags of fluid and replace the empty oxygen tanks. I say this industry is occasionally shadowy because a certain amount of attention has recently been paid to the fact that it is largely unregulated. In an era in which hospital medicine is watched more and more closely by insur-

ers and officials in managed-care plans, in which individual doctors often feel constrained by fear of malpractice suits, home health care companies flourish with very few standard guidelines, price controls, or watchdogs. There have been rumblings of scandal here and there, some connected to suggestions of kickbacks, in which doctors are rewarded for referring patients to particular companies.

In general, however, home medical care, even at its most technology-intensive, has proved so much less expensive than hospital care that insurance companies have been downright eager to reimburse for it. A child who needs long-term antibiotic therapy can have the fanciest antibiotics in the world, as well as a visiting nurse to start the IVs and infuse the drugs, all for a small fraction of the cost of a hospital stay of several weeks' duration.

And, of course, that child gets to be at home, just like Donnie. Acutely ill or chronically ill, their parents get to take care of them and mitigate the illness in any way they can. Perhaps the most peculiar aspect of home health technology is that as these devices come into the home, they can work a transformation on the parents that looks somewhat eerily familiar to a doctor looking on.

When they first walk into an intensive-care unit, when they first see someone they love attached to monitors and intravenous lines and maybe even a ventilator, most people recoil. The body looks violated, monstrously wired to cold and inhuman devices. Work in a hospital for a while, train as a doctor or a nurse, and you start to see it differently: oh good, an intravenous line, fluids and medications, and, if necessary, nutrition. Oh good, a ventilator, oxygen in the lungs. Oh good, monitors, warning if any problems arise. The machines actually give you a sense of control, security, and safety. You would rather be in the intensive care unit with a sick patient, after all, than in some other, less well-outfitted place.

Move all these devices out into the home, and they can start to take on this same aura of familiar, necessary, and even welcome pieces of life support. They become, in



some very real sense, part of the household, part of the family. The child is safer for having them there, and the parents feel safer and more sure of themselves for being able to provide these comforts, these solutions, these safeguards. With the help of reasonably portable pieces of technology and people trained to service them, sophisticated medical procedures become part of a household adjusting to a child with special needs.

### THE BARE NECESSITIES

So today I spent a long time on the phone with the phone company. I have a patient who has epilepsy that is not very well controlled; she takes her medication, but she still has seizures, some of them serious. The phone company had shut off her parents' phone for nonpayment, and I was calling to try to get it turned back on. Her parents need to be able to call me, to call the neurologist, to call for an ambulance, I said. We check her drug level frequently, and we need to be able to get in touch with the family if the level is dangerously high or low.

The people at the phone company explained to me about the unpaid bills and the reason for cutting off the service. And then I said, all over again, a phone in the home is an essential piece of technology to keep this child safe. In my medical judgment, this family must have access to a home phone. And in the end, the phone did get turned back on for local service.

But I could not help thinking, somewhat ruefully, that I could have arranged for a home nebulizer in half the time. No one would have given me any argument, ever, if I had said that it was an essential piece of technology for a sick child. Medicare would have paid, as would any HMO. The company would have come that same afternoon to install it.

We have reached the point where it's sometimes much easier to arrange for more advanced, more unusual machines than for the electricity to keep them running, or for the telephone to call the ambulance when something goes wrong. "It could be a matter of life or death," I said, perhaps not quite honestly to the supervisor at the phone company. I was saying life or death, but I was thinking about planning, plugging in, and paying the bill. ♥

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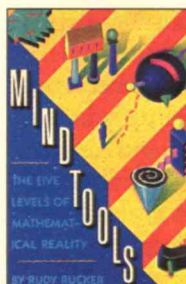
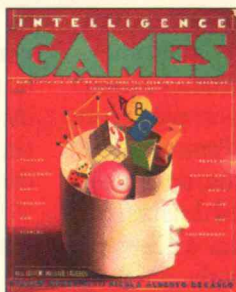
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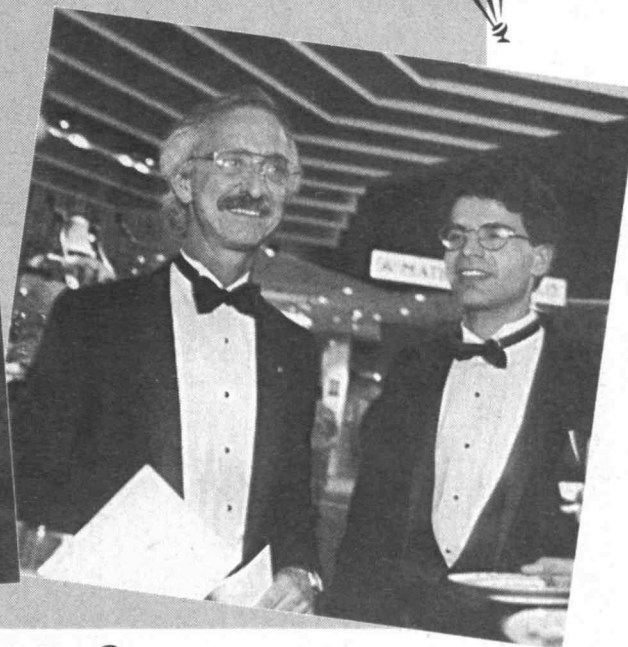
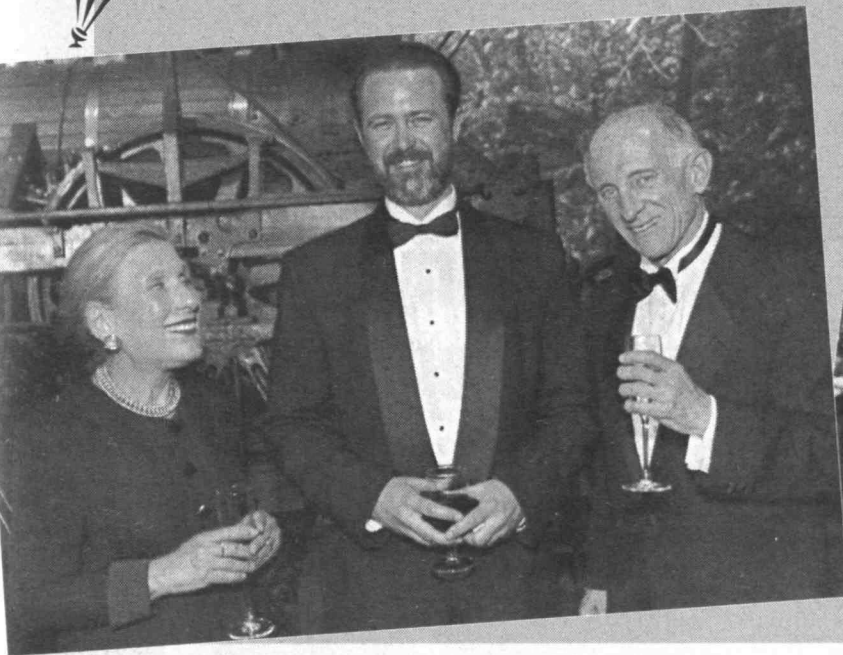
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# MITnews

FROM THE ASSOCIATION OF ALUMNI AND ALUMNAE OF MIT

JULY 1995

## First Lemelson-MIT Prize Awarded



**H**OLLYWOOD MAY HAVE THE Academy Awards, but the gala presentation of the \$500,000 Lemelson-MIT Prize in Washington, D.C., presided over by MIT President Charles Vest, gave the Oscar night a run for its money. Amidst much pageantry, the premier edition of what is now the world's largest single prize for invention and innovation went to William Bolander, a 34-year-old engineer whose work at General Motors has already led to nine patented innovations in automotive technology.

Also honored for their "lifetime achievement" were two icons of innovation: William Hewlett, SM '36, and David Packard. Their Palo Alto-based Hewlett-Packard Co., founded in 1939, helped change the face of the electronics industry around the world.

The award ceremony was held earlier this spring before some 450 black-tie guests in the courtly Flag Hall of the Smithsonian Institution's National Museum of American History. Replete with choked-up acceptance speeches and large-screen video presentations about the winners, the "Lemmies"—as one of the participants jokingly dubbed the affair—aimed for a level of glitter not normally seen in scientific and engineering circles.

The idea to take a page from Hollywood's book in designing the prize ceremony was calculated: the award was established, in large part, to show that life as an inventor can be rewarding and glamorous. Jerome Lemelson is a solo inventor with over 500 U.S. patents (the largest number of any living inventor), covering processes and products including key components of

*Celebrating the spirit of invention at the Lemelson-MIT Prize ceremony in Washington D.C. are, from left: Dorothy Lemelson, prize-winner William Bolander, Jerome Lemelson, Pappalardo Professor of Mechanical Engineering Woodie Flowers, and Lemelson Fellow Benjamin Linder—who is a PhD student in course II.*

the VCR, cassette tape recorder, supermarket bar-code scanners, and laser-guided machine tools. He conceived the annual award after commissioning a survey of high school students around the country that showed they knew far more about the achievements of entertainers and sports stars than they did about

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## THE ELECTRONIC ALUMNI/AE ASSOCIATION

It's a sign of the times that we have two of what we call "photo and caption" pieces on uses of the Internet in this issue of MITnews. We wrapped up the issue on May 12, and within a few weeks the MIT Alumni/ae Association expected to have its pages up on the World Wide Web. That includes a page for MITnews, a magazine-within-a-magazine that serves the Association and its members. Be prepared: Class notes and Course news are not on the Web, just as the MIT Alumni/ae Register is not available at your local bookstore. Some information has to be kept in the family until Net security is more sophisticated. Meanwhile, look us up at <http://web.mit.edu/alum/www/>.

—Susan Lewis

# First Lemelson-MIT Prize Awarded

continued



the accomplishments of famous scientists and inventors.

"America's young people seem to have lost interest in the fields of science and engineering," Lemelson laments. "They believe that the way to riches is through fame and fortune in sports and entertainment," a trend that he hopes to undermine. As President Vest put it, a key objective of the Lemelson-MIT prize is to "shine a light on these unsung heroes of our modern age and to call attention to the important and satisfying role they play in our society."

The selection of the Lemelson-MIT prize winners was administered by an independent panel of judges under the direction of Professor Lester C. Thurow, who chaired the prize committee. Thurow is, not coincidentally, the Jerome and Dorothy Lemelson Professor of Management and Economics at the Sloan School.

The prize and the professorship are both elements of an \$11 million initiative at MIT and other universities sponsored by the Lemelsons to foster innovation and invention. For the first year of the prize, Thurow decided that MIT-affiliated inventors would not be eligible, but this restriction will be lifted for ensuing years.

In announcing the Lifetime Achievement award at the ceremony, Sloan School Dean Glen Urban cited Hewlett and Packard as "people with a creative blend of technological insight, manage-

*The Smithsonian Institution's National Museum of American History was host to a distinguished line-up for the Lemelson Prize ceremony, from left: inventor of the human-powered "Gossamer Albatross" Paul MacCready; Dean of the Sloan School Glen Urban; Jerome and Dorothy Lemelson; Lemelson Professor of Management and Economics Lester Thurow; Director of the National Museum of American History Spencer Crew; Secretary of the Smithsonian Institution, I. Michael Heyman; and President of MIT Charles Vest.*

ment skill, and leadership" who built one of the nation's most successful companies. Bolander, on the other hand, was noted for his youth and energy—an important "creative spark" on GM's engineering teams. In nominating him for the Lemelson Prize, his colleagues at the company noted that at age 34, Bolander is already a four-time winner of the firm's coveted Boss Kettering Award, which goes to roughly 1 percent of GM engineers.

Bolander's engineering ideas contributed to a low-cost and effective traction-control system in GM's Saturn cars.

And his work at GM while still an undergraduate led to the so-called "limp-home" cooling system in the Cadillac Northstar engine, which allows it to continue to function even if it should accidentally lose all of its cooling fluid.

Sitting on the dais with the prize winners and with Vest, Thurow, and Urban, surrounded by leaders in the science and technology community from academia, industry, and government, the 71-year-old Lemelson appeared overwhelmed by the realization of his idea after years of planning. He said he hoped this was just the beginning of a program that would continue for many years to "inspire our

young people to invest their thoughts and aspirations to contributing to the future of this country by innovating and inventing new products of technology."

More than a match for the emotion and grandeur of the occasion was the actual Lemelson trophy itself—an elegant lead-crystal column designed at MIT'S Media Lab and containing an illuminated hologram of the prize seal. Unveiling the high-tech crystal award at a pre-ceremony press conference, Thurow quipped: "The Oscar may capture more of the world's attention, but frankly ours is by far the more exciting prize."□

—SETH SHULMAN

## Latest in Gymnastics Dynasty Wins National Title



**S**HEILA ROCCHIO, '97, captured the 1995 National Collegiate Gymnastics Association Division III national championship in the all-around, setting the MIT record in the combined four events by scoring 36.3 of a possible 40 points.

For an adult to be a top performer in women's gymnastics—a sport arguably best suited for the

.....

*MIT women's gymnastics coach Catherine Rocchio emphasized mental preparation to improve the balance-beam performance of her star athlete (and sister) Sheila Rocchio, and it seems to have worked.*

# Latest in Gymnasitics Dynasty *continued*

weight/strength ratio of prepubescent little girls—while coping with an MIT undergraduate program would be noteworthy enough. Her accomplishment was even more remarkable considering that she hypoextended her elbow in warm-ups at the championship event and performed with a throbbing arm covered in technicolor bruises from bicep to wrist.

But in terms of commitment to MIT and to the sport, that's only the tip of the iceberg. Sheila is also one of five



members of a family with seven MIT degrees between them. Her sisters, Catherine, '89, and Rosemary, '90, also starred in women's gymnastics at MIT, and Catherine is now Sheila's coach. A fourth sister, Eileen, is a graduate of

Brown, where she was an All-Ivy League gymnast and qualified for the U.S. National Team. If their parents, Joe Rocchio, '57, SM '58, and the late Mary Roan Rocchio, '57, SM '65, could have bottled the secret of their parenting success, customers would have lined up.

Knowing your athletes well, knowing how to keep them focused and motivated, is a big part of coaching, so the sisterly ties may well have been an important factor in Sheila's success at nationals. "I never thought I would have a chance at winning the national championship, especially with my injury," she said later. "Throughout the meet I was more worried about my elbow than my performance."

But Catherine, a three-time team captain and 1985-86 most valuable gymnast at the Institute, had a strategy: "We tried not to let her look at her elbow," Catherine says. "When Sheila wasn't competing, she was lying down with her

elbow in ice packs. When it was her turn in the rotation, she took off the ice and performed."

Not only did Sheila have her best meet ever in the all-around, but she also was the only gymnast

in the competition to qualify for the individual event finals in each of the four disciplines—uneven bars, balance beam, vault, and floor exercise.

"Sheila worked really hard on the beam for the two weeks preceding the championships," Catherine said. "Last year at the championships she fell off and this season she has had a tough time throughout the year. She had a clean routine at the ECACs (Eastern College Athletic Conference championships) but was very cautious. Since then we worked on mental preparation, and she had a great routine."

"I had no idea I had won," Sheila remembers. "I knew I had my best meet ever, but I still thought I was third or fourth. When they called second place, all I could say was, 'Oh, my God!!!!' I hugged everyone in sight—I still couldn't believe it was true."

"It really helped Sheila that the whole team qualified for nationals," Catherine added. "Last year there were only three [MIT] gymnasts who qualified. This year she knew she had the whole team behind her." The team came in seventh—their best-ever performance.

On the second day of competition, and with a still-throbbing elbow, Sheila earned All-America recognition in three of the individual event finals at the 1995

*MIT gymnastics runs in the family for the Rocchio sisters (left to right): Catherine, '89, Sheila, '97, Rosemary, '90. Their parents, Joe and the late Mary Roan Rocchio, are both members of the Class of '57 (see page MIT 24.)*

## letter

### Who Did What

The April issue of MITnews contained an error regarding the relationship of net.Genesis (a company formed by MIT students and recent graduates) to the webmasters of the Student Information Processing Board (SIPB). In the article, "Prize-Winning Product Gives New Company a Foot in the Door," it says that the "net.Genesis team" worked with SIPB to set up the latter's web server.

The SIPB web server went online around July 1993 and was quite likely one of the first 100 web servers ever set up. It was entirely the work of SIPB members and prospective members. Net.Genesis was not formed until 1994. Perhaps the confusion lies in the fact that Matthew Gray, '95, one of the founders of net.Genesis, was among the original SIPB webmasters.

SIPB is a volunteer student organization; it neither relies on the services of commercial consulting agencies nor promotes such agencies, even when there is an overlap in membership.

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championships to go along with her victory in the all-around. She placed second in the vault, third in floor exercise, and fifth on beam.

Success is not new to Sheila. Her performance at the 1994 national championships earned her All-America recognition in the all-around (5th place) and the uneven bars (6th place). She currently holds MIT records in the all-around, floor exercise, vault, and balance beam. Sheila was the ECAC champion on the balance beam in 1994. She was able to accomplish these feats despite the loss of her mother in January of that year, after a lengthy battle with cancer.

"The reason I love coaching at MIT is because the athletes competing are doing so because they love the sport," Catherine says. "Last year one of the gymnasts had to take an exam one hour prior to competing in the national championships. We faxed the professor her exam from the gym. The ability to make that kind of commitment, competing at an elite level both academically and athletically, is truly commendable."

No slouch in the multiple commitment department herself, Catherine holds a full-time job as a software engineer at Bolt, Beranek & Newman in Cambridge in addition to her coaching duties at the Institute. □

—ROGER CROSBY

*The author is MIT director of sports information and communication.*

I wanted to do, some other opportunity suddenly surfaced that was diametrically opposite from what I thought I *should* do. Each time I jumped at the opportunity."

Trained at MIT as a civil engineer specializing in hydrology, hydraulics, and water resource systems, Perkins, '55, SM '59, ScD '66, joined the faculty as an instructor in 1962, and by 1973 he was a full professor. "After spending

of the Graduate School and was planning to return to the Department of Civil and Environmental Engineering as an 'ordinary' professor. Instead, I agreed to take over as director of the Master of Engineering program in Course I."

As dean of the Graduate School, Perkins oversaw a slew of programs such as teaching assistantships, counseling, and fellowships. He separates his accomplishments into two categories: the visible and



## "A True Gentleman" Moves on to the Next Event

**A**fter more than 40 years at MIT, the last 12 as dean of the Graduate School, Frank Perkins is finding himself with a feeling of déjà vu. "Throughout my career at MIT, every time I got to the point where I was thinking perhaps it was time to do something new and began to think clearly about what it was

two years as a special assistant to the dean of engineering, I thought I should move back to a faculty position," he remembers. "That's when I took the position of department chairman. After that I thought once again about an academic position. However, the opportunity to become associate provost came along. Now I'm stepping down as dean

the invisible. The visible accomplishment of which he is most proud is an annual workshop

for new Institute faculty and graduate teaching assistants that grew out of his concern to put "more focus on teaching." He recalls, "We handled it in the uniquely MIT way. There was not a formal office with lots of staff people. We did it as a grassroots effort to foster interest in and prepare people for teaching." The workshop, which is typically attended by 125-150 teaching assistants and 30-40 faculty, includes a day-long presentation designed to address the concerns of

GRADUATE DEAN  
FRANK PERKINS

.....

# "A True Gentleman"

*continued*

those who are teaching at MIT for the first time. It is followed up during Independent Activities Period in January with seminars open to the entire community.

Perkins points out that the workshops have uncovered "a gold mine of superb teachers" at MIT. Perkins himself was presented with MIT's Goodwin Medal for "conspicuously effective teaching" in 1965. "The common myth is that there is a conflict between teaching and research," says Perkins, "but we have a large cadre of faculty members who debunk that myth."

**A**s a not-so-visible accomplishment, Perkins cites the fact that "the whole staff of the Graduate School has been successful in creating a kind of environment where students can come for help in resolving problems." He says, "In a community of 5,000 graduate students and 1,000 faculty, all of whom are supercharged and working very hard, there is inevitably a certain amount of personal conflict that arises. I take pleasure in the fact that we have been able to solve most of these problems in ways that make students feel secure about being here."

Perkins may believe his effort in this area is invisible, but several authoritative voices highlight this contribution along with others for which Perkins is responsible. "Frank Perkins has been extraordinarily effective in several dimensions," notes President Charles Vest. "He has been a national leader among graduate deans, having served as chair of the Council of Graduate Schools. He is a valued contributor to Institute affairs through his service on the Academic Council. Above all, he is known for his deep understanding of the lives and issues of MIT's graduate students and for his ability to resolve problems and conflicts."

"Out of all the administrators, when you see Dean Perkins, you get a warm, fuzzy feeling," observes Roger Kermode, who is working toward a PhD in media arts and sciences and served as the 1994-95 president of the Graduate Student Council (GSC). "He always listens and comes out to speak at GSC events. He's a mentor." Kermode believes that

"it will be hard to find someone with Dean Perkins's open-door policy."

The 1993-94 GSC president, Caryl Brown, SM '95, says that "due to the strong decentralized nature of MIT, Dean Perkins didn't have a strong influence on the departments, but he has a good view of the big picture." Brown describes Perkins as "an ally" of graduate students within the administration and echoes his GSC successor's sentiment on Perkins's legacy: "It will be one of compassion and a true understanding of students."

Working side-by-side with Perkins for the last seven years, Associate Dean Isaac Colbert is quick to praise not only Perkins's contributions to the Graduate School, but his character and working style as well. "The first thing about Frank is that he's a true gentleman, with quality and integrity," says Colbert.

"Without elbowing others," Perkins has been able to make the graduate school "a more accessible place," says Colbert. He estimates that 20 percent of the graduate student body annually seek assistance from the Graduate School, a figure that does not include e-mail communications or repeat visitors. Colbert notes that with more and more students interested in graduate education, the Graduate School also is spending a great deal of time counseling undergraduates.

Having had a close-up view of Perkins's effectiveness, Colbert is concerned that after Perkins retires there could be "a fragmentation of the responsibilities of the Graduate School which would cause disparity for students from area to area. Students need a place outside of their departments to get away from the power relationships in their areas. They need a refuge."

**P**erkins's departure from the Graduate School comes at a time when all of graduate education in the United States is in need of refuge. "The infrastructure [to support graduate education] that has been built up successfully since World War II is in some sense threatened," Perkins believes. He points to the decline in the number of federal fellowships from a high of 60,000 in the post-Sputnik era to 20,000 today, and to changes in the rules governing the fund-

ing of federal research projects that make it more difficult to pay graduate student tuition.

Although "the simple-minded answer is that [graduate student enrollment] will decline because federal funding will decline," Perkins says, the results actually are not all that easy to forecast. New professional programs, joint programs with industry, and programs involving more off-campus education may offset the decline in student enrollment due to federal funding cuts, Perkins speculates. "During my watch," he says, "MIT has added new professional master's degrees through the Center for Real Estate and Leaders for Manufacturing, as well as a new MBA and four master of engineering degrees. All are attempts to be responsive to the needs of professions" he notes, and most involve industrial participation, resources, and facilities.

**A**cademic programs and administrative structures may change, Perkins says, but the character of MIT graduate students has staying power. "What I see is a group of incredibly bright, eager students prepared to work long hours in pursuit of education. I hear 'Generation X' and other buzzwords to distinguish one generation from another, but I don't sense significant change."

What Perkins is surprised by, however, is the turns of his career. His upcoming sabbatical will revolve around efforts to catch up on his profession. He also plans to sharpen his Spanish language skills in preparation for his participation in an MIT project in the western province of Mendoza in Argentina, an unexpected return to the country where he worked on his last sabbatical 23 years ago. Since Perkins will no longer have to commute daily from Brockton, he said he plans to start jogging "religiously" again.

After one hour of reflecting upon his service at the Graduate School, Perkins concluded, "It was a learning experience. Even after 12 years, I was still learning from the students." □

—STEPHANIE V. GREPO

# Politics and Entrepreneurship on the Internet

FYI



## Organizing Against the "Contract With America"

When students at campuses across the country—including MIT—demonstrated against the Republicans' "Contract with America" in March, some observers noted a legacy of '60s idealism and rhetoric. What was distinctly different, however, were the tools young activists employed to organize themselves: computers, typesetting software, Internet features like the World Wide Web and electronic mail—all were in constant use. Much of the credit for getting the whole ball rolling this spring, according to the *New York Times* and *Newsweek*, goes to Rich Cowan, '84, SM '87 (above). Cowan has been politically active since his undergraduate days, and although he is employed as a computer-support specialist, he spends the bulk of his time running the Cambridge-based University Conversion Project, a clearing house for progressive campus groups that he founded in 1991. For an article by Marina Bandidos Todd on the recent political activities of Cowan and other young organizers of kindred spirit, see the *MITnews* Web page at <http://web.mit.edu/alum/www/>.

## Making a Million on the Internet—Not

When the MIT Enterprise Forum of Cambridge decided to focus its spring workshop on conducting business over the Internet, it knew what it was doing. That was easy to see when some 470 online entrepreneurs and would-be entrepreneurs showed up. An equally wise choice was James Clark, '74, SM '81 (right), as the keynote speaker. Clark is vice-president of the Software Products Division at AT&T Global Information Solutions. He has given serious thought to what the rush to the Internet is all about and gives a dynamic delivery to his essentially cautionary message. He and other speakers agreed that it is important right now for technology-oriented businesses to establish a "presence" on the Net. But Clark believes entrepreneurs should not count on producing income from their Internet operations any time soon: while it is "the" topic in some circles, the Net has a long way to go before it is as ubiquitous as the telephone or even the VCR. You can check the MIT Enterprise Forum homepage on the World Wide Web at <http://web.mit.edu/entforum/www/>.



# GSEs Getting Involved

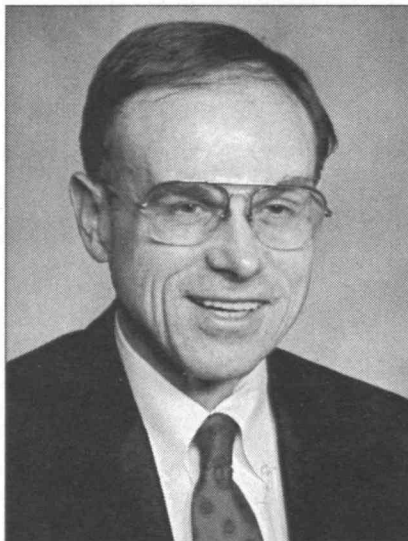
**R**ecently I spent an evening with a group of Sloan School alumni/ae planning the start-up of a new Sloan School club in the Puget Sound area. All but one of the members of this group are what the Alumni/ae Association refers to as Graduate Student Exclusives (GSEs), meaning their undergraduate degrees are from other institutions. Nevertheless, they each made the decision to become an active participant in MIT alumni/ae activities.

Each person expected to benefit from involvement in a slightly different way: One anticipated learning more about biotechnology from local alumni/ae active in this exciting new industry. Another looked forward to stimulating discussions about public policy issues with fellow alums—one of the few groups he expects to really think through the relevant issues. Several others hoped to discover job opportunities and meet MIT alumni/ae who can provide a picture of growth companies in this region. And one envisioned learning which local technology-based companies might offer the hottest investment opportunities.

These leaders believed that other GSEs would also benefit from affiliating with a volunteer club in similar ways. In fact, one future meeting is planned to focus exclusively on local employment opportunities for Sloan graduates, a prospective benefit that many professionals can appreciate in these times.

**T**he evening before the Sloan Club planning session I had spent with Stanford Anderson, head of the Department of Architecture, and a group of MIT alumni/ae (mostly GSEs) who teach architecture at universities around the world. Stan organized the gathering with the assistance of Will Redway, the director of the Graduate Alumni/ae Program (GAP). It was held in conjunction with the annual meeting of the Association of Collegiate Schools of Architecture in Seattle, and it offered another perspective on why GSEs

become involved in Association activities. Architects from across the country were drawn to Seattle by shared pedagogical and professional concerns, and the reception gave those with MIT



*Gary Schweikhardt*

degrees a further opportunity to cement ties, see old friends, and hear about new programs and faculty at the Institute.

The latter program is an example of how since 1990 GAP has been hosting events at professional meetings across the country. These receptions not only provide alumni/ae with an opportunity to see one another, but it gives them a chance to network with members of their professions. The program started modestly: in 1990, they hosted four such events. In FY 1994, GAP co-sponsored receptions with 10 departments, including the Ocean Engineering anniversary that drew 300 attendees. Another established GAP program involves receptions for alumni/ae in the greater Boston area to meet new department heads—occasions when grads also socialize with current students and faculty.

This year, GAP staff helped the Graduate Student Council (GSC) put on its formal ball, and GAP provided support

for orientation for new graduate students in September and February. GAP is also in the early stages of designing services for the Institute's international GSEs, with the long-term goal of offering opportunities similar to those envisioned by the Sloan group in Seattle.

**G**SEs are active in many aspects of Association and Institute activities. Leslie Hruby, SM '73, and Melinda Skaar SM '87, both serve on the Association Board of Directors, while Barbara Goldoftas, SM '82, and Woodie Flowers, PhD '73, are members of the Technology Review Board. Jorge Diaz Padilla, PhD '74, Laura Ring, SM '91, Sharon Shepard, SM '81, and I are members of the Board of Directors of the MIT Enterprise Forum.

Many GSEs are active or life members of the MIT Corporation, including Pedro Aspe, PhD '78; Colby Chandler, SM '63; Edward David, ScD '50; John Haas, SM '42; Robert Horton, SM '71, Lawrence Hough, SM '72; Judy Lewent, SM '72; and Kenichi Ohmae, PhD '70.

I'd like to encourage all GSEs to participate. Choose the activity that suits your time availability and that offers the benefits in which you are most interested. The network of MIT alumni/ae is one of the most interesting and diverse groups of people that you will find anywhere. It is a link to intellectual stimulation, career guidance, professional development, and lively social events. Through your involvement, you can also enjoy the satisfaction of building an Alumni/ae Association that supports and enhances the teaching and research mission of the world's leading technological university.

*R. Gary Schweikhardt*

R. GARY SCHWEIKHARDT, SM '73, President of the Association of Alumni and Alumnae of MIT for 1994-95. Alumni/ae may send messages to Gary at (800) MIT-1865 and at <mitalum@mitvmc.mit.edu>.

# ClassNotes

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Please send news for this column to:  
**Bob O'Brien**, acting secretary  
25 Keith Rd.  
Pocasset, MA 02559

17

Please send news for this column to:  
**Don Severance**, acting secretary  
39 Hampshire Rd.  
Wellesley, MA 02181

18

Please send news for this column to: Class Notes Editor,  
*Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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I want to report the death on December 9, 1994, of our dear classmate, **Walter Weiskittel**, of Baltimore, Md.

I think I can do no better than use the story by his son,

Ford Weiskittel, which tells in his own words the essential story of his father's death. I think his classmates will be moved by the story, as I have been. The story as narrated by his son is printed below.

"I am writing to let you know my father passed away on December 9th. He had been driving his car and living as he has been for many years up until October 20th, when he started feeling weak. He went into a nursing home on October 27th where he received excellent care. But he kept experiencing physical problems—difficulty swallowing, difficulty walking, even difficulty holding a fork, all probably a result of a series of small strokes. His mind and memory remained sharp until his death. I am sure that he would have you and the other members of the Class of 1919 to be the first to know."—**W.O. Langille**, secretary, 20 Rogers Rd., Far Hills, NJ 07931

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*Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

21

## 75th Reunion

We are preparing these notes on the 60th anniversary of the first formal meeting of the MIT Club

of Northern New Jersey. The occasion was a gala oversubscribed dinner meeting held on the old Income Tax Day (the ides of March) in

1935 in the Downtown Club, Newark, after more than a year's planning. Karl Taylor Compton, president of MIT, was the principal guest and main speaker.

We are the last survivors of six alumni from the classes of 1918 through 1922 who were selected by local groups to form a steering committee authorized to form the club, run the initial meeting and serve as the first several presidents—we were the fourth!

Once more, all of us have been dealt a stunning blow in the deaths of two wonderful friends, both loyal supporters of MIT and our class. It is with heavy heart that we extend to their families the sincerest sympathy of everyone who ever has had ties to 1921.

**Antonio Helier Rodriguez y Cintra**, chemical engineering, known affectionately as Rodie or Helier for his kindness and friendship, was a native of Havana, Cuba, living in Tampa, Fla., where he died on June 17, 1994. Owner of three huge "sugar centrals" and a chain of movie theaters headed by Havana's largest, he will be remembered by all '21ers for his invitation to a week-long interim reunion in the then island republic just before it took the left turn off the international road.

The St. Laurent and Clarke couples especially treasured the honors of being house guests of Helier and his late wife, Graciela, in their suburban hilltop castle. Active in some 10 undergraduate clubs at MIT, including Pi Delta Phi fraternity, Helier had been president of both the Latin-American and Cosmopolitan Clubs and an officer of the Institute Committee.

Helier and his lovely wife left Cuba after the governmental changes, to live in Tampa where a number of Graciela's family already made their homes. The two were very active in the MIT Club of Cuba and were generous supporters of MIT. They had no children. All of us have suffered a great loss.

As we completed these notes another most shocking and sorrowful death report was received—that of Helen St. Laurent—peacefully on March 8, 1995, in her Manchester, Conn. home at age 96. MIT VP and Treasurer Glenn P. Strehle, '58, and Assistant Treasurer D. Hugh Darden attended March 13 services in Manchester for which Mr. Strehle was invited to speak.

Helen was predeceased a number of years ago by her husband, **Raymond A. St. Laurent**, chemical engineering, cooperative. The couple had no children but are survived by nieces and nephews. Helen's passing hurts all the more because she sounded so cheerful in a recent phone conversation and had assured us she was OK except for her hearing loss and the necessity for using a cane. We will add further information as it becomes available.

All of us will greatly miss a great lady for her friendship, hospitality, and kindness as well as caring for others and her deep love and loyal

and generous support of our beloved MIT.

We are doubly honored and delighted to have sent you our annual appeal for your welcome initial or loyal customary vital support of MIT's needs for important research (cancer, AIDS, and the like plus educational development) via the consummate judgment of two outstanding Nobel laureates. We are supremely pleased with their interest and offer you our sincerest thanks and appreciation in the confidence that you already have mailed a check to Cambridge to heed the wise counsel of Professors Sharp and Smull, or will do so immediately upon this earnest reminder.—**Carole A. Clarke**, president and secretary, 608 Union Ln., Brielle, NJ 08730-1423; (908) 528-8881; **Samuel E. Lunden**, assistant secretary, 6205 Via Colinita, Rancho Palos Verdes, CA 90274; (310) 833-1480

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Recently Mary and I had an interesting chat on the telephone with **Cecil H. Green**, an outstanding member of our class. The class history records that he received a large number

of awards and honorary degrees. Since then, the Queen of England came to Texas to make Cecil a Knight of the British Empire. Cecil is well and on the go. He was planning to fly to La Jolla, Calif. He said he spends one third of his time in Texas, one third in La Jolla, and one third on airplanes.

Please send news for this column to **Royal Sterling**, president and secretary, 2350 Indian Creek Blvd. W., Apt. D-201, Vero Beach, FL 32966.

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Please send news for this column to: Co-secretaries: **Katty Hereford**, 237 Hacienda Carmel, Carmel, CA 93923; **Colonel L. Henry Stern**, 2840 S. Ocean, #514, Palm Beach, FL 33480

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There have been no further responses to the first reunion letter. Of those who had replied that they could not attend, many indicated it was too difficult to travel. Two

had illness in the family. **Walter Rhodes**' son, Jerry, reported that his father, who had been living in Maryland, had been moved to the Buffalo Valley Lutheran Village nursing home

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in Lewisburg, Pa., where his great-granddaughter lives. Walter is suffering from a dementia similar to Alzheimers.

The passing of one classmate must be reported. **Clifford O. Abrahamson** died in West Palm Beach, Fla., on February 18, 1994. For a number of years he was district manager for the Louis Allis Co. in Philadelphia. When he retired, he moved to East Falmouth on Cape Cod and wintered in Florida. Several years ago he decided to make Florida his year-round residence.—**F. Leroy (Doc) Foster**, secretary, 434 Old Comers Rd., P.O. Box 331, North Chatham, MA 02650

## 26 70th Reunion

Please send news for this column to: **Donald S. Cunningham**, secretary, c/o Ronald Frazier, 132 Middle St., Braintree, MA 02184

## 27

One of our classmates who was selected a member of *Who's Who of America*, **Charles Wesley Meytrott**, died on January 31, 1995, in Brooklyn after long years of illness. This was one day before his 90th birthday—a man who created a tremendous life. He worked for electric power utilities for his entire working career. Starting as power sales engineer for Florida Power Corp., he went on to become assistant to executive VP, then manager of the Power and Industrial Department of Ohio Electric Power Co. He managed various sales and engineering bureaus of New York Edison Co. and its successor firm, Consolidated Edison Co., Inc. He was appointed assistant VP and finally VP in charge of sales and customer relations until retirement in 1970.

Wesley's life before and after his retirement was filled with volunteer positions in 37 organizations listed in *Who's Who*. The most significant to show his interests and diversity: Brooklyn Council, Boy Scouts of America; chairman of fund-raising, American Cancer Society; trustee, Methodist Hospital, Brooklyn; AEEE James A. McGraw Medal for Electrical Men, 1954, and many more. He married his wife, Inez, in 1931, and she predeceased him in 1990. He certainly could be proud of his accomplishments.

Your Secretary and wife, Phyllis, enjoyed a three-week cruise vacation in January 1995. Aboard the elegant liner *Chrysal Harmony* from Ft. Lauderdale to Rio de Janeiro and Buenos Aires, we took advantage of great days at sea with the beautiful large cities of South America.—**Joseph C. Burley**, secretary, Isle of Springs, ME 04549; **Lawrence B. Grew**, assistant secretary, 21 Yowago Ave., Branford, CT 06405

## 28

**Frank A. Taylor** has been researching family papers regarding the life and work of his maternal grandfather **Edward Kubel (1820–1886)** who was an immigrant from Bavaria and maker of scientific and astronomical instruments in Washington, D.C., for the U.S. Government and the Astrophysical

Observatory of the Smithsonian Institution. His work was continued by his son, Ernest, who later made instruments for the U.S. Geological Survey, and the Smithsonian has instruments of their manufacture. Frank is putting in their care an instrument makers lathe the elder Kubel purchased in Berlin. A full account of their work and times will make interesting reading and the display worth visiting at the Smithsonian.

As we unfortunately have to expect, our class notes report the deaths of three more classmates. **Donald McClelland Sturznick** passed away on February 15, 1995, at Toms River, N.J. Don was a chemical engineer at Texaco Oil Co. in Houston, Tex., at the time of his retirement. . . . **Abraham G. Stone**, known as **Abraham Goldstein** during our years at Tech, died on March 15, 1995, in Capitol Heights, Md. Abe was at the U.S. Patent Office in Washington all his working years. . . . **Ralph Elmer Boeck** died on November 22, 1994, at Wawatosa, Wisc. We do offer our condolences to their families.—**Ernest H. Knight**, secretary/president, 168 Ai Plummer Rd., Raymond, ME 04071

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Please send news for this column to: Class Notes Editor, *Technology Review*, MIT, W59-200, 77 Mass. Ave., Cambridge, MA 02139

## 30

This is one of the quinquennial "lame duck" issues of the Class Notes. Every five years class secretaries prepare a set of Class Notes prior to the reunion class elections for

publication after the elections; hence they do not know at the time of writing whether or not they will still be secretary when the Notes are published. I plan to again be a candidate for reelection and hope that you will vote for me in June.

As previously reported, **Allan McLennan** retired from New England Electric in 1970 and then worked as an electrical engineer for Charles T. Main for an additional 12 years on jobs that took him to Panama, Iran, Brazil, Argentina, Jordan, and Saudi Arabia. He reports that he is in reasonably good health and is active in a Men's Club in Wakefield, Mass., where he lives. He keeps in touch with Panamanian and Iranian friends, as well as with relatives in Australia and England.

Unfortunately, most of the other items at hand are more or less downbeat. Several weeks ago I learned that **Jack Bennett** had had a stroke earlier this year in a telephone conversation with his wife, "Bunny," in Florida. While he appears to be on the road to recovery, it seems unlikely that he will be able to get to Cambridge in June.

In February, Louise and I attended three successive Elderhostel programs—in Hilton Head, S.C.; Clemson University in Clemson, S.C.; and University of N. Carolina in Chapel Hill. While in Hilton Head we stopped in to see Anne and **Dave Houston** at their lovely home overlooking the Inland Waterway. At the time of our visit Anne was experiencing a back problem that she thought would keep them from getting to the 65th Reunion.

We have been notified of the deaths of three

more of our classmates: **Harry Shaw** on May 19, 1994; **Dick Foster** on August 29; and **Allan Stone** on September 15. Harry Shaw obtained his undergraduate degree at the University of Washington and spent a graduate year at MIT. His career activity was in the copper industry and he retired as assistant works manager of the Phelps Dodge refinery in El Paso, Tex. At one time he was president of the American Institute of Metallurgical Engineers. He is survived by his wife, Gladys, four sons, and ten grandchildren.

Dick Foster worked for Campbell Soup Co. in Camden, N.J., for 36 years and retired as chief food technologist. After retiring, he and his wife, Josephine, made their home in Chatham, Mass. Those who attended the 45th Reunion at Chatham Bars Inn may remember the Dick Fosters for two reasons: Dick was the youngest-looking classmate at the reunion (no gray hairs at all) and they received a mug for traveling the shortest distance to the reunion. A sad note from Jo tells of Dick's long illness caused by an unusual event. In July 1988, he was bitten by a deer tick carrying Lyme disease. He was ill for six years with post-Lyme symptoms, the most troublesome of all being polyneuropathy. Since Jo had had nursing experience, she was able to care for him at home most of the time, but it must have been a very difficult time for them. In addition to Jo, Dick is survived by a son, a daughter, two grandsons, and a great-granddaughter.

I do not have anything at all in my records about Allan Stone's career activity. In 1967 he retired to Elkhart Lake, Wisc., where he was living at the time of his death. During his retirement he apparently spent quite a bit of time restoring antique automobiles. His wife, Mercer, predeceased him in 1991. He is survived by two daughters and three grandchildren. A note from Carolyn reveals that she has established a memorial fund for him at the Bank of Elkhart Lake and will eventually divide the proceeds from this fund between MIT and Theta Delta Chi.—**Gordon K. Lister**, secretary, Apt. #40, 5707 Williamsburg Landing Dr., Williamsburg, VA 23185

## 31 65th Reunion

Please send news for this column to: **Wyman P. Boynton**, secretary, 668 Middle St., Portsmouth, NH 03801

**32** We have received the sad news that **John (Nick) W. Flatley** died November 12, 1994, five days after his wife, Barbara, passed away. Nick was a past president of our

class. Nick worked for the Treasury Department in Washington, D.C., for 35 years and at the time of his retirement in 1969, had attained one of the highest career positions at the G.S.A. He was a devoted husband, an avid golfer, and a daily communicant of the Church of the Little Flower in Bethesda, Md. He was active in our class activities and will be missed.

The Alumni/ae Association informs us that our classmate **Mary Baker McNair Scott** died

February 9, 1995. When we receive obituary information we will pass it on.

The *Boston Globe* ran an article about octogenarians who are still working. **John Brown**, our President pulled rank on me and ordered me to pass on the interview to our classmates. I therefore excerpt the following.

"Octogenarians' secret of success: work. When it comes to his business, Swampscott's Melvin Castleman doesn't keep secrets—least of all his age. He's 84, one of a small but dogged corps of octogenarians around the *North Weekly* region for whom work is as necessary to life as the air they breathe.

"At a time when folks are told they are old at 60 or 65—and dismissed with a gold watch and a handshake—many individuals have marched right by that arbitrary cutoff date.

"And why not? 'I can't say sitting around waiting for meals is a way of life,' says Castleman, a chemical engineer who has just ducked out of a company meeting into a crowded little office that beckons him even on Saturdays. 'I think a person has to have some work, whether for money or not, to get fulfillment in life.'

"For 57 years, he has found that fulfillment at Lloyd Laboratories, Inc., in Peabody, a company that produces leather finishes and is named after his brother and 79-year-old business partner, Lloyd Castleman. The third partner in the business is 74.

"But for most people Castleman's age, pulling in a paycheck—and all the satisfaction it symbolizes—is no longer part of their lives. According to the 1990 U.S. Census, Massachusetts had 355,796 people aged 75 and older. Of that total, 5,125 worked full time and 10,888 worked part time. For residents aged 85 and older—of which the Census counted 89,791—428 worked full time and 865 worked part time. Castleman and his partners are strategizing on how to expand their foreign business. Their products can already be found in Taiwan, Pakistan, and South America. They are also working on a new line of water based finishes. And then there is the question of how to bring along the next generation of company managers.

"I enjoy the challenges," says Castleman, who is married and keeps track of six children, a pack of grandchildren, and squeezes tennis matches into his schedule three days a week. 'I think you have to have something that's growing under your influence. You're part of life, part of nature. The satisfaction comes from being constructive, not destructive.

"If I won the lottery, would I quit?' He answers his own question without hesitation. 'I don't think so. But maybe I'd get a fancier tennis racket and a new pair of sneakers.'"

**Charles H. Fischer** of Chicago died on May 8, 1994. Charles had an unusual and interesting career. He was a civil rights activist. He enlisted in the Marine Corps in 1942 and served in the South Pacific, achieving the rank of captain. He was awarded the Silver Star for service at Iwo Jima. After the war, he joined Illinois Bell as a supervisor. He left that position to work as an organizer for Progressive Party presidential candidate Henry Wallace in 1948. After that, he joined the United Packinghouse Workers of America, a Chicago labor union, and served as international representative and administrative assistant to the president.

After his 1977 retirement, he became active in the opening of relations with China through

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Stephen K. Kenda, '79

the U.S. China People's Friendship Association, Chicago chapter. He led several trips to China, including two delegations with U.S. labor leaders. Fischer is survived by his wife, Sylvia Gordon Fischer; a son, Charles; two daughters, Katherine and Barbara; seven grandchildren; and two great-grandchildren. . . . **Manley St. Denis** assures us that those classmates who make the April Hawaii trip will have a worthwhile experience.—**Melvin Castleman**, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907

# 33

When Steve Fossett left South Korea for a solo balloon flight across the Pacific this past February 17, I instinctively knew that Steve was the son of our very own Charalee and

**Dick Fossett** since I had been told that Steve lived in Chicago and worked here at the Board of Trade. Confirming this with the Fossetts blew me away. Ostensibly, the flight was to mark the 50th anniversary of the liberation of Korea from Japanese occupation. The flight also helped scientists at Chicago's Loyola University observe the effects of El Niño currents on atmospheric conditions. Most notably, the flight was the first successful solo crossing of the Pacific after setting a 5,430-mile record. Maneuvering in altitude between sea level and 26,000 feet without lateral control, Steve escaped the most severe storms and survived the bitter cold without a working heater. Charalee and Dick write: "We're proud of that boy." Who wouldn't be? The mountain-climbing family started Steve climbing at age 11. The 5,000-foot peaks of Southern California were the breeding ground for Steve's conquest of the six highest mountains in seven continents later on. His admitted failures are two attempts to climb Mt. Everest. Among his exploits are running the Boston Marathon, swimming the English Channel, the Mountain Man Triathlon (100 miles on snowshoes, skis, and ice skates), sailing and dual-ballooning the Atlantic Ocean, driving with a Porsche team in the Le Mans, mushing a dog-sled team twice in the Iditarod (once disappointedly human in -40° F temperatures to a 47th place finish), racing his newly purchased 60-foot trimaran to new records in the Round Britain and Ireland race and Round Ireland race (the latter record was broken in force 7 winds by one day and two hours, the previous record being over three days). Steve's trimaran, the *Lakota*, will next enter the Newport-Ensenada race off the Northern California coast. To punctuate Steve's latest accomplishments, Tom Brokaw interviewed Steve in his Colorado home for a special NBC show. As to Steve's inner fortitude, Tim Cole, who went with Steve on dual-balloon flights over the Atlantic, said it best: "Steve's endurance is remarkable. . . (he has) the capability under high pressure and miserable conditions to operate efficiently." Asked about future plans, Steve said he had none through November of '95 but that the ultimate challenge in balloon flight was to fly around the world. Steve, now 50 years young, gets a good portion of all this higher energy from Charalee and Dick. Dick was our class president since 1933. In 1993, he stepped down from class president to vice-president. At our 60th Reunion, Charalee was indefatigable in all our activities as well. But credit

goes way back to when Dick, as Steve's scoutmaster, had his son climbing mountains for an Eagle Scout badge. Our class is justly proud of the Fossetts.

Nice to get a letter from **Arthur Hungerford** who afforded me an opportunity to snitch on his past MIT associates. Alpha Phi Mu Delta fraternity brother to the core, he says he now lives across the street from the Phi Mu Delta house at the University of Pennsylvania. He mentions he is still in contact with **Leighton Rickards** and **Donald Fink**. I also stumbled on the fact that one of my most-revered architectural graduates, the late **Joseph E. Carbonell**, was his fraternity brother. What prompted Art to write was the report on **George "Hardy" Ropes** in the Feb/March *Technology Review*. Art has a photo of a golf foursome at the 25th Reunion with the late **Richard "Dick" Morse**, the late **Otto Putnam**, and **George Ropes**. Art says: "Happy times then! Many gone since! I'd surely be glad if I could catch up with George again!" According to Art (who was President of the Technology Christian Association at MIT), he had **Arra "Steve" Avakian** serving with him then in the Book Exchange.

The indefatigable saga of **Lillian and John Longley** comes to me in an after-Christmas summary of their experiences from 1935 to the present date. Their 50th anniversary gets short notice. Lil's going to Disney World with two sons, a daughter-in-law and four granddaughters, then joined later by another son and his girlfriend—all while John remains at home with Lil's old "Bentley Turbo 10" computer. I don't think John can get anywhere near imaging Lil's talent with watercolor paintings on that computer.

I was delightfully surprised to hear from **Edward Atkinson** and **Meyer Schnitzler** who both sent me "A True Tall Tale about the Hancock Tower," (*Boston Globe*, March 3, 1995) relating the structural problems of an edifice of which the critic **Robert Campbell** says "in its aloof way. . . (is) among the world's most beautiful buildings." No surprise however that the famed structural engineer, **William Le Messurier**, SM '53, who devised the tuned mass damper that limits the sway of the Tower, is an MIT graduate. Strangely, a Swiss engineer reputed to be the world's leading authority on steelframe high-rise buildings convinced everyone concerned about the safety of the building that it would not fall over under certain wind conditions if the building was braced diagonally from its base to the top with 1,500 additional tons of steel. Since everyone involved with the Hancock drama was legally bound to keep its problems secret, Campbell's treatise will come as no surprise to those involved.

On another note, **Henry A. Rahmel** (VI-A, SB, SM) writes to inquire about the progress of our Class Memorial Fund. When you read this, I am hopeful that it will be in effect. Henry came to MIT as a junior from a cooperative engineering course taken at Chicago's Lane Technical H.S. In eight years with A.C. Nielsen, Broadcast Division, as VP and general manager he is the claimant of 16 patents. During World War II, he became involved with the Navy Training Program Administration at Northwestern University. He married Mary Triebel in 1940 and they had three sons. . . . In a letter to the Alumni/ae Office, **Mona Brown Norman** regretfully reports her hus-

band's passing on December 23, 1994, just after his 84th birthday. Mrs. Norman says that although married to Lieutenant Commander **Edmund B. Norman**, USNR, for 52 years, in which time her husband shared with her his many fond memories of MIT, "We never got back there so I could see it too." Although an undergraduate at MIT, Commander Norman finished his education at the University of Richmond. He was a planning engineer with Virginia Electric Power Co. for 38 years except when serving with the Pacific Fleet during World War II. In and out of uniform, Commander Norman was a strong proponent for peace. A promoter of good race relations in his Petersburg community, he was acknowledged as a "Peacemaker" at his celebration service. He was associated with the Boatwright Society, the Petersburg Public Forum, and the Downtown Churches United of Petersburg. He also served as a deacon at the First Baptist Church. He is survived by his wife, Mona, two sons and two daughters, and 12 grandchildren. A photo of a happy Norman family is featured in the 25th Reunion Classbook.

One of our most-revered classmates, **LeBurt Webster**, passed away January 26, 1995. Burt was a building-block of Class of 1933, as those who knew him well will readily acknowledge. Burt came to MIT from the University of New Hampshire, took an SB in Course XV, and then went on to Bentley College for degrees in accounting and finance. He served as comptroller for the Ozalid Corp. then with Raytheon as assistant comptroller. Before retiring in 1975 as comptroller with Compo Corp., he served several other firms as either treasurer or comptroller. He remained as an independent financial consultant to several Boston area companies in his later years. Burt was also treasurer for the Kalmia Woods Association as well as being a member of the Concord Finance Committee. Fittingly, he became our Class Treasurer just prior to the late **Charles P. Britton**. It was Burt Webster who wrote me in his own hand, though almost blind, that Charles Britton had passed on. In that same letter to me, he had loving words for the care given him by his wife, Elizabeth Ward Veeder, whom he married in 1940. Two sons, one daughter, and three granddaughters survive him. I close by acknowledging the enthusiasm he brought to the 60th Reunion Committee's planning and by mentioning the telegram we received from him during the 60th Reunion dinner at the Sheraton-Tara, when he apologized for not being with us because he was, in his words, incapacitated. We missed him then as we do now. Our heartfelt condolence to Elizabeth and the family.—**Berj Tashjian**, secretary, 1245 Briarwood Ln., Northbrook, IL 60062-4556; (708) 272-8683

# 34

It seems that it is very difficult to get classmates to write with news of themselves and others. The telephone, on the other hand, is a great medium.

With postage constantly increasing in price and the long distance companies waging price wars, apparently, that is the way to go. A telephone conversation with **Mel Sousa** produced some interesting things about a very active classmate. After a great

career in the aeronautical industry that brought him to the West Coast, Mel and Winnie retired to a ranch in Northern California, where they still reside. Mel has two major activities these days, raising oranges and breeding horses. His orange crops have been great but Mel finds that the government is trying to drive the agriculturist out of business. If he had to depend on the profits from his orange grove, it would be very difficult indeed. However his horse breeding is doing very well. Mel breeds and raises Dutch Warm-Blooded horses. They are a European strain, very spirited and much sought after. He has just sold one of them for a very substantial sum. He now has a 4-year-old that is ready to go on to the market, so if any of you are interested in a great piece of horse flesh, get in touch with Mel. Winnie has had a few health problems, but fortunately they are under control now. Mel is in great shape, as he always was. He is still running 2 to 3 miles every day, and every once in a while he will run and walk for 8 to 10 miles, through orange and olive groves, along dirt roads, and alongside a canal which is in his area. Sounds even better than the beach at Coronado!

Speaking of Coronado, **Jim Eder** visited recently on one of our stormy days, an example of sartorial elegance, with a handsome new sports jacket, traditional Eder beret, and furred cane umbrella. Even our doorman was impressed with his English gentleman appearance! We had a nice lunch at a restaurant overlooking the busy San Diego Harbor. Jim reports that **Mal Stevens** and wife Julie have moved to Laurelmead in Providence. They had sold their house last summer in anticipation of the move. However, their new apartment was not ready and they finally had to move in with their daughter for six weeks. While they had a delightful stay, they felt disconnected from the world without their own phone or address, etc. They have made many new friends at Laurelmead, in addition to the ones they already knew in Providence. They will not go to their camp in Maine this summer.

Jim also brought a letter that he had received some time ago from **Ken Lippitt**, who lives in the greater San Diego area in Poway. A telephone call revealed that Ken was still well, playing golf about once a week, although he now concentrates on par 3 and 4 courses. Jim came to California to work for IBM in 1937. It was here that he met and married Cathy, a native Californian. He later was transferred back to the East Coast for 20 years, but returned to California in 1960. He retired from IBM in 1972, and has been living in Poway since then. They have three sons and two daughters, most of whom are living in the area, with the exception of one living in Colorado. They are both in good health, and besides golf and bridge, they enjoy a great relationship with their teenage grandchildren. With **Jim Eder**, **Ken Lippitt**, and **Jim Sweeney** all living in the area, we will try to get together for a mini-reunion when we return in December.

A letter from **George Gahm** contains the following that should be of interest to us: "Apparently, I've made a practice of changing careers for most of my life, and now, although it is not a career change, I am doing things that I resisted doing a good part of my life. Most of the physicians at my time of life are retired; in fact, there are none in my medical

# ClassNotes

school class still in practice other than me. I am still in active psychiatric practice in addition to performing physical exams for airplane pilots. I am the only aviation medical examiner in my area authorized to perform first class exams for airline pilots. Because of my expertise in both areas I am called upon to examine pilots who for psychiatric reasons have their ability to pilot aircraft in question. . . . You know that physicians are notorious for their illegible handwriting, and I am a supreme example thereof. I have decided to improve this situation by learning to use a word processor, hence this letter." This seems to be the answer to a class secretary's problems. If all you readers would go out and buy a word processor, I would be deluged with letters from you.

President **John Hrones** writes from Florida. He has word that **King Crosby** and wife Charlotte have just moved from Pelican Cove in Sarasota, Fla., where they have lived for nearly 20 years to Lakepoint Woods, a very attractive retirement community, only 2-3 minutes from Pelican Cove. They spend their summers in Osterville on Cape Cod. John reports that he has played bridge with them several times during the past year. They are both keen bridge players and golfers, and are both enjoying good health. John has talked with the **Henry Humphreys** on the phone. He and Jeanne live in Bradenton, Fla. Henry took an SB in marine transportation and ship operation, no longer offered at MIT. He was with W.R. Grace in New York City for 20 years followed by 7 in South America where he was in charge of the West Coast shipping for a Swedish line. John sees him about once a year at the MIT Club of Southwest Florida meetings. John is also president of that group. **Wally Read** (Course X) is a regular attendee at the MIT Club of SWFL. He was with Mobil Corp. in New York City for 28 years, followed by a stretch in Princeton, N.J. One of his daughters lives in Palm Beach, Fla., and the other in Des Moines, Iowa.

**Norm Krim** sent along a clipping from the *Journal of the Photographic Historical Society of New England* with a picture of our own **Paul Wing** at the microphone accepting the Fellowship Award of the National Society. We reported on that event a few issues back, but the inscription of the award is of interest: "For his extraordinary knowledge of stereoscopy and his aid to individuals and organizations worldwide. For promoting stereo photography in the United States and Europe through lectures and numerous published papers. For an outstanding exhibition record over the years." Congratulations, Paul.

Your secretary hosted a party at the Marriott Hotel in honor of an important upcoming birthday of his wife, Mollie. I have also had some magnificent sailing. The last trip, I was trying to catch up with the all female crew of America<sup>3</sup>, unsuccessfully, and sailing alongside the two Japanese boats that were out practicing for the Louis Vuitton Challenge races. That same trip, aboard a brand new 32-foot Catalina, we found ourselves within 50 feet of a spouting whale. . . . **Dan Strohmeier**

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who lives in Scarsdale, N.Y., has been retired for 23 years. He is active in yachting and spent seven months this year sailing his 40-foot yawl *Malay* from Buzzards Bay to Maine. . . . **Ernie Massa** writes from Pompano Beach, Fla., where he winters, as follows: "Jeanette and I enjoyed our 60th Reunion at MIT last June; especially since June 1st was our 54th wedding anniversary! We are looking forward to our Cardinal & Gray reunion in 1995. . . . We have been enjoying warm winters in Florida for the last 25 years; as well as the beautiful summer months in Cohasset, Mass., where we have lived with our two sons, Ernest, Jr., and Ronald since 1951."

The Alumni/ae Office has forwarded the sad news of the passing of some of our classmates. **Aaron Shaffner**, of Framingham, Mass., died on January 4. No other details are available and condolences have been sent to his sister. Also, **Henry Mazer**, who was in public health, died on July 10, 1994. His wife, Esther, writes with a contribution to MIT in his memory: "Henry and I moved here in 1985 from Boston, Mass., where we lived all our married life since 1939. We have two married daughters and six grandchildren and five great-grandchildren between the United States and Israel." We will acknowledge. **Hal Reynolds** died on June 28, 1994. He is survived by his wife of 53 years, Gertrude, and his daughter. After graduation, Hal obtained a master's degree from the Harvard School of Engineering in 1935. He was employed by Stone and Webster Engineering Corp. before and after his service in the Ordnance Division during World War II. He then served as a sales engineer for Turbine Equipment Co. in Boston. He also served as a consultant to Wentworth Institute. In 1959 he started his own sales representative business, Reynolds & Halliday, Inc., which he operated until 1980. From 1980 to 1986 he represented Trecon Limited of Canada selling snow melters.

The Coronado season ends in a few weeks, and your next set of notes will come from Newton, Mass.—**Carl H. Wilson**, secretary, 48 Druid Hill Rd., Newton, MA 02161-2023

# 35

**P. Roland Hanson** writes from his home in Kingston, N.H., telling us that it has been more than 17 years since he and his wife, Mabel, sold their large Winchester, Mass.,

home and moved north to their smaller home on 3/4 of an acre overlooking Kingston Lake. They brought 13 trailer loads of composted material they had accumulated and built up the land to support over 1,600 sq. ft. of garden. Over the years they have had a variety of vegetables, 18 fruit trees, several hundred strawberry plants, and five varieties of grapes. As a result they have a surplus they are happy to share with relatives, friends, and neighbors. Mabel made lots of pies, jams, jellies, and juices for them to enjoy during the winter. Roland says it has not been all hard work and no play for they have taken time out to take a wonderful trip to Scandinavia, another one to Hawaii, and several motor trips to Nova Scotia, Cape Cod, Washington, D.C., and on through the Blue Ridge Mountains to North Carolina.

**Henry B. Kimball** writes from Walpole, N.H. He included a copy of the latest list of

responses of those planning to attend our 60th Reunion received by **Randolph Antonsen**. **Bob Olsen** was interested in forming a crew. Our report will be made in the October issue.

We celebrate the lives of two of our former classmates: **Malcolm G. Cameron** died July 1982; and **Reid Ewing** died January 2, 1995. **Malcolm** lived in Irvington, Va., and worked most of his life in the Department of Highways, U.S. Dept. of Transportation. He was a Course XVI graduate.

**Reid Ewing**, Course X, received a master's degree in 1936. He was a Bayside trustee and founder of several manufacturing companies in the Milwaukee area. He was a member of the American Chemical Society and the AICE. He is survived by his wife, Margaret, and two children. Condolences are being sent to the survivors.

**Richard F. Jarrell**, Course VIII, started working for his father's Jarrell-Ash Co. repairing microscopes and selling prism spectrographs that were manufactured in England by Adam Hilger, Ltd., the world's first maker of spectrographs in 1900. Dick was asked by the GE River Works to build a commercial version of the geology spectrograph as recommended by Professor G.R. Harrison, director of MIT's Spectroscopy Laboratory. Dick's father agreed, GE ordered, and before the instrument was completed Jarrell-Ash received priority orders from International Nickel, National Bureau of Standards, and Union Carbide in Oak Ridge. His spectrograph provided the highest dispersion and widest wavelength coverage of any commercial spectrograph in the world, "and that was why Dean Harrison had recommended it for the analysis of harmful trace elements in super-alloys for aircraft engines and in uranium for the atom bomb." After the war, orders came in from around the world and Dick had to travel and install the instruments. Jarrell-Ash began manufacturing in Le Locke, Switzerland, for the European market and became the third U.S. company to form a joint venture with Japan for the Asian market. Needing capital, Jarrell-Ash merged with Fisher Scientific followed by merging into Allied; this was followed by acquisition of Instrumentation Labs. Recently Thermo Corp. acquired IL and the Thermo Jarrell-Ash Co. became a profitable operation. Dick serves as consultant two days per week, to the latest combo which includes Hilger in England and Nippon-Jarrell-Ash.—**Allan Q. Mowatt**, secretary, 715 N. Broadway #257, Escondido, CA 92025; (619) 432-6446

# 36

## 60th Reunion

First alert from President **Alice Kimball** on our 60th Reunion: Tech Night at Pops is June 6, and Alumni/ae Day and lunch is June 8. Commencement is June 7, and only the 25- and 50-year classes can be accommodated at the ceremony. McCormick Hall rooms will be available to our class these three days. Alice has canvassed a number of classmates on where, when, and how to schedule our non-Cambridge activities, and the preference so far is for a nearby inn for June 4 and 5, or for the entire five days as an option. It should allow access to Pops and Alumni/ae Day without

long driving or bussing. Tennis, golf, and swimming facilities do not seem to be a priority for octogenarians. A gathering away from other classes, such as lunch at an attractive restaurant, or a shore clambake, could appeal to the 28 classmates whose residences are within reasonable commuting distance. Stay tuned.

Due to failing eyesight **Dorian Shainin** has retired from active participation in Shainin Consultants, Inc., but his two sons are continuing the very active international business. Dorian says, "I'm pleased to lend my advice on occasion." . . . Last October the *Lehigh Valley* (Pa.) *Morning Call* featured a cover story on "Wiley" Post, pictured holding his own photograph of Lindbergh and the Spirit of St. Louis before take-off to Paris. Wiley was "just a 13-year old kid hanging around a Long Island airfield with a Brownie camera. (He lived one mile from Roosevelt.) He wasn't afraid of Lindy's identity, but news photographers were crowding around, so Post got his own shot." It is now in the library of the Smithsonian, which sent him a small piece of the plane's fabric covering after repairs. The story mentions Wiley's training aviation cadets during World War II and his receiving the FAA's Distinguished Service Medal in 1979. Flying and airport management have been his life.

After 30 years driving from West Texas to their summer home in Charlestown, R.I., Edith and **Ford Boulware** will fly hereafter. Years ago Ford once had lunch with **Tom Johnson**, who summered in Little Compton, which is "down the road a piece," an expression with little meaning in that watery state. Both Ford and Tom were oarsmen and members of Tech Boat Club. We are hoping that they make it to Cambridge for the 60th Reunion event.

Cheers for the lives of **James Baker** (Course X), **Thomas Kato** (Course XV), and **Henry Marbie** (Course I)! A note from wife Anne tells of **Jim Baker's** death March 3, after several years of complete paralysis from strokes. Except for emergency hospital stays, she cared for him at home with the help of nurses. Jim transferred from Vanderbilt University in our sophomore years and continued to receive an SM in the Chemical Engineering Practice School. He met Anne during a promising career with Monsanto in Norfolk, Va. However, the surviving partner of Jim's father's department store in Madisonville, Ky., begged Jim to take the reins. There he won local and state honors as a businessman who "maintained an island of quality in a sea of discount," and who saw to it that "poor children had necessary new clothes when returning to school." A public housing unit is named in his honor.

Calling Tom Kato in Tokyo after the earthquake in Kobe, I reached his wife, Chieko, but understood only the word "dead." Then a letter from daughter Emi Hasegawa: "My father died August 13, 1993, from heart insufficiency following a massive stroke. I'm very sorry to write such sad news." She recounted **Douglass Hawk's** long ago hospitality (see last issue) and told of her daughter's current college education at University of Melbourne, Australia. Tom was born and raised in the United States, but was in Japan at the time of Pearl Harbor and got drafted into service. Along with Ichiro Takahashi, '37, he was treated very harshly by the military for their MIT connection. Postwar

Tom married Chieko and was president of Datsun Belgium Corp. Then he headed construction of sanitary systems in Saudi Arabia, and later was deputy director of the Tokyo offices of Washington State and New York. In 1986 he was honored by the MIT Club of Japan for long service.

A note from **Henry Mabie's** widow, Ingeborg, to *Technology Review* tells of his death July 31, 1994. She could not be reached by telephone, but Henry's 50th Reunion biography suggests a personality of humor and candor. His Tech friends adopted a last-name nickname of "Perhaps," and the biography section on accomplishments reads, "Nothing worth writing about." Henry was in Cuba during eight months of Castro's revolution, working on a Standard Oil refinery but "not involved, just happened to be there." For a seemingly low key guy, he had some high level employers: Exxon, Control Data, Raytheon, Rutgers, and New York Central R.R. The last was closest to his true love—urban rapid transit—but design of such was in a class with buggy whips much of the time.

Footnotes from readers of earlier tributes: **George Robinson** led the MIT Orchestra for two undergraduate years, and his virtuosity as a violinist later won positions for many years in Pennsylvania and New Jersey symphony orchestras. . . . **Julian Rifkin** flew his push-pull propeller airplane on numerous trips from Duxbury to their vacation home in the Cayman Islands (200 miles below Cuba), where he established a water company, movie theatre, and condo development. Truly an entrepreneur.—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501; (505) 988-2745; **James F. Patterson**, assistant secretary, 170 Broadway, Pleasantville, NY 10570; (914) 769-4171

# 37

In case we missed it at the time, **Frank Goddard, Jr.**, has kindly supplied a clipping from the *Attleboro Sun* on the life of **Albert L. Varrieur**, who died last year at 77. Frank and

Albert grew up across the street from each other in Attleboro, went all through school, high school, and MIT together. Albert graduated in Course XVI and went on to have a successful career with the Glenn L. Martin Co. According to the *Attleboro Sun*, he became a VP in 1955 with complete responsibility for the Titan ICBM program. After completing the Denver project for the development system of a missile system for the Air Force, he returned to Baltimore as VP of the Martin Corp. He was instrumental in the merger of Martin with the Marietta Corp. and became assistant to the president in 1962. He retired in 1964.

**Ralph Webster** has written a newsy letter, not altogether rosy, (he has had a tumor and a hernia), but he managed to visit Seattle with his oldest daughter, Sue, to visit his youngest daughter, Jackie, and her youngsters—just getting out of graduate school! Already, he adds, they are teaching and one is back for another term at graduate school.

**Fred Ferrary**, who, before his retirement, was on the board of the John Tyler Commercial College, tells of an adventurous trip taken with his wife and middle son in Spain. "In Andalucia, we wound up in Gibraltar, the

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British rock from which my folks emigrated in 1913, and where some relatives still live." On their return to the states, their interest in the Civil War resulted in a week's visit to Charleston with his daughter, her husband, and his granddaughter. There was also a flight to San Francisco to visit family. On a more serious note, Fred says, "I just found out I have diabetes and am on a special diet, which is driving my wife crazy." And finally, "My hobby is fooling around with my computer."

The relocation of **Art Zimmerman** is explained in his latest letter, "Agnes and I thought we were getting to the point where it would be wise to be nearer to family, of which we had none in the Cleveland area" and so they took the leap to Port Washington, Wisc., where their daughter and family have lived for 18 years. "We are located in a newly-created retirement facility, located just one mile from Jane and Tom's residence and we are enjoying our new life and seeing our grandchildren often."

**Harry Corman** and wife Jane are spending summers in their home in Waterbury, Vt., and their winters in Naples, Fla., not to mention that he is active in structural activities in his semi-retirement. His letter is revealing: "our tennis gang here in Naples just gave me a bang-up 79th birthday party. We are playing tennis, but not like the old days. Jane and I are suffering through the beginnings of golf and learning new swear words. We visited **Sid Mank** and **Dorothy** in Charlottesville, on the way down to Florida. They are doing fairly well and moving to a smaller house this month. . . . As for myself, I am enjoying working for a few architects and builders up in the wilds of Vermont; I expect to keep it at that so we can take our three-month break in the winter."

Our classmate **Paul Allen** of Pasadena, Calif., is now fully retired from mining, he says. But, when he last wrote, he was planning a flight to Santiago, Chile, and a look at the La Escondido coppermine, which, by 1996, will be the largest mine in the world in terms of copper production. After that, we will fly to Easter Island and there board the *MS World Discoverer* which will take us to Tuamotus, Archipelago, Marquesas, and other islands (in French Polynesia). Thereafter, we shall disembark in Tahiti and fly back to the United States."

This concludes our monthly summary of letters received from classmates. Hope the rest of you will get on the ball and tell us your exciting adventures, sans Spanish.—**Leonard A. Seder**, assistant secretary, 1010 Waltham St., B342, Lexington, MA 02173; **Robert H. Thorson**, secretary, 66 Swan Rd., Winchester, MA 01880

# 38

On January 17, 1995, the Kobe earthquake took more than 5,000 lives with damage estimated over \$100 billion. Some 300,000 were homeless and about 50,000 houses and

dwelling units were destroyed. In response to Class Agent **Don Severance's** expression of concern, **Yoshio Mikimoto** writes from Tokyo: "Disaster in the Kobe area was centralized in a relatively small area, such that the city of Osaka only 25 miles away was not affected badly. However, the center of Kobe had such strong shakes not only horizontally,

but also vertically that damage was done because the building codes did not consider vertical shakes at all. Even buildings only two or three years old of several stories in height had a floor in the middle crushed completely, which is something very unusual. Also, the steel pillar supporting beams of both railways and highways had these beams cut off a few feet from the top, looking as if they were sliced off with a sharp knife. This time the damage showed a much different phenomenon than earthquakes we have had in Japan in the past."

**Yoshio** thanked **Don** for his concern about the disaster and expressed regret that Japanese officials turned down numerous rescue teams which were ready to be dispatched from many friendly countries, since he felt that many lives could have been saved otherwise.

What about those class members who either cannot or who prefer not to associate with formal Class of 1938 activities? What part can they play on the pages of the *Technology Review*? They can let us know what they have been doing and what their interests are today. Even though we are not able to get to see them, we are very interested in what their experiences have been and what they like to do at this stage of their lives. Either write or phone your class secretary or assistant secretary and give us your comments.

One alumnus who we have not seen since graduation is **Ciro R. Scalingi** who took mechanical engineering and ran both track and cross country all four years while at Tech, serving as captain of the cross country team during his senior year. During World War II he was in England with the Eighth Air Force Fighter Command and met his future bride. Back in the United States he got a job with Daisy Air Rifle Co. in Plymouth, Mich. In 1958 they moved their plant from Michigan to Arkansas where he continued as VP of manufacturing. After 17 years with Daisy, he left to do consulting work, ending up in Tallahassee, Fla. For the 10 years before retiring in late 1981, he worked for the State of Florida in the Governor's Office as management administrator. He describes his job as trying to do for the state of Florida what Vice-President **Gore** is trying to do for the federal government in the area of combining, eliminating, and making operations more efficient. After retirement he and his wife moved to McLean, Va., to be near one of their three daughters. In addition, they have a son, six grandchildren, and one great-grandchild. At this point they prefer to continue their quiet life style.

Along with returns from the mini-reunion mailing, **Ed Hadley** pieced together a number of current status items including the fact that **Mr. and Mrs. Don Barnaby** attended three Elderhostel programs last fall. Father **Bill Guindon**, S.J., had his right knee replaced in the fall. . . . **Bruce Leslie** has an illness in the family. . . . **Paul Tillson** is "busy replacing parts in the old body." He got a pacemaker in 1994. . . . **Nick Wheless** is in Shreveport, La. . . . **Jack Wilbur** has been in the Lutheran Home of Worcester for a year and has Parkinson's disease. . . . **Alice and S.E. Hutchins** celebrated the Republican sweep in the nation's capital. . . . **Bill Shamban**, president of W.S. Shamban & Co., is still reasonably active with two small companies including one in a "new" technology.

In addition to "reasonably active" class-

mates we have a few who can be classed as "fully active." For instance, Ed Hadley had a pre-op exam in one hospital December 7, a fainting spell December 8, and went by ambulance to another hospital; had another pre-op December 9, and had a kidney stone crushed in a third hospital December 10. Then he and Jean flew to Capetown, South Africa, December 13 to board the *MS Marco Polo* on which they had a wonderful and relaxing time cruising to Durban, Reunion, Mauritius, the Seychelles, the Moldives, Sri Lanka, Penang, and Kuala Lumpur before disembarking in Singapore. They flew back via Taipei and Los Angeles to Boston on January 10. Then Ed had another kidney stone removed January 18 before taking off to visit daughter number 9, grandchild number 8, and family in Pompano Beach, Fla., from January 28 to February 6; returning in a snowstorm. In mid-February they journeyed to Rutland, Vt., to spend a week with child number 7.—**Paul R. Des Jardins**, secretary, 6251 Old Dominion Dr. Apt. 310, McLean, VA 22101-4807; (703) 534-4813; **Gretchen Birge**, assistant secretary, 233 Carroll St., Apt. 202, Sunnyvale, CA 94086-6264; (408) 736-5011

## 39

The MIT Sloan Graduate School of Business ranked "FIRST" of 50 U.S. graduate schools of business. It was ranked by business school deans and MBA program

heads for the *U.S. News and World Report* (March 20, 1995). MIT Sloan Graduate School of Business was in the top five for courses including finance, management information systems, production/operations management, and real estate.

The MIT Graduate School of Engineering ranked "FIRST" of 50 U.S. graduate schools of engineering. It was ranked by engineering school deans for the same magazine. MIT Graduate School of Engineering was "HIGHEST" in aerospace, chemical, civil, materials/metallurgical, mechanical, and nuclear, and "SECOND HIGHEST" in computer and electrical electronics, and "FOURTH HIGHEST" in biomedical specialties.

Those compliments for FIRSTs were earned after 134 years of input by MIT's dedicated directors, officers, professors, academic and administrative staffs, its students and alumni/ae, its many benefactors, and the everloving spouses of all of them.

Now is a good time to reassess how we, whose careers were so enhanced by education at MIT, can confirm our appreciation. One can conclude: to give extra thousands to MIT. Tax benefits can flow from gifts to MIT and '39ers can get expert advice from **Ernie Kaswell**, class agent, or **Len Mautner**, class gifts chairman, or **Glenn Strehle**, '58, MIT treasurer.

In tribute to MIT Sustaining Fellows, a plaque listing their names will be mounted outside Room 10-250 during a dedication ceremony on May 6. Among '39ers named on the plaque are: (as Founding Life Sustaining Fellows) **Leonard Mautner**, Mr. and Mrs. **Harold J. Muckley**, and Mr. and Mrs. **Harold R. Seykota**; (as Life Sustaining Fellows) **William Brewster**, **Richard J. Donohoe**, Mr. and Mrs. **Michael V. Herasimchuk**, **Harold Hindman**,

and **James H. Laubach**; (as Founding Annual Sustaining Fellows) Mr. and Mrs. **Charles S. Mercer**; (and as Annual Sustaining Fellows) Professor and Mrs. **Morris E. Nicholson** and **Elihu Root III**.

**Beatrice and Burns Magruder** enjoy indoor tennis four days a week during winter at Barnstable and they grow a quarter-acre of vegetables in the summer. And, between serving aces and growing tomatoes, they serve their community as members of the Compact of Cape Cod Land Trusts to protect the natural beauty of the Cape.

**Yolande and Ernie Kaswell** vacationed in Florida and visited **Aletta and Bob Touzalin** at Naples. . . . **Anne and Bill Murphy** recovered from pneumonia and jewel larceny at the 55th. They enjoy life from their residence on a Clearwater Golf Course, and will vacation in Honolulu in May. . . . **Dix Loesch** will summer at his Vashon Island home in Puget Sound. From Vashon, one commands spectacular views west to Mt. Jefferson, and northeast to Mt. Baker, and southeast to Mt. Rainier. On clear days, Dix's views span 120 miles! . . . **Bill Christensen** served 2 years in the Pacific with the Sea-Bees and he joined Hershey Foods in Pennsylvania after World War II. After retiring from Hershey, he worked six years constructing a new medical center. Now retired in Annville, Pa., Bill has a new personal computer and is competing with unseen gremlins for control of its keyboard.

In Ohio, **Joan and Jack Hamilton** received the four-column article and picture from the *Alaska Business Monthly Magazine*, reporting **Dom Donatello's** election to Alaska's Business Hall of Fame. I had relayed news of Dom's honor to the *Technology Review*, but welcome seeing Jack's handwriting and his confirmations that good news travels fast and the mills of the gods grind small and exceedingly fine. . . . **Ryder Pratt's** career included creating successful enterprises in St. Louis. One of his companies produced investment castings. One or more machine shops produced a variety of products. Now retired to Scottsdale, Ariz., he owns an aerosols business, finds time to golf twice a week, and is about to take his family on its eighth major cruise, this one to Barbados, St. Thomas, and other beauty spots in the West Indies. **Ryder and Betty's** long time friend has become **Ryder's** new wife and we hope they will revisit the Northwest and stimulate a '39er mini reunion. . . . **Collin Alexander**, president of Technology Enterprises, Inc., writes from Minnesota: "Still having fun in the process field of high-vacuum-deposited thin films. Technology 'carry-through' is far more exciting and efficient than technology 'transfer'..."

Here is a 53-year confirmation of "It's a Small World": At Aberdeen Proving Ground in July 1942 I was assigned to be Adjutant of a battalion to be formed and sent immediately to Egypt. Its mission was to repair tanks, artillery, trucks, and small arms that would be damaged during a battle to be fought at El Alamein, 90 miles west of Alexandria. Maurice "Bud" Shank, ScD '49, and Newman Marsilius, SM '42, were two lieutenants also assigned to the new battalion. We arrived in the desert 10 miles from Cairo on the second day of the El Alamein major battle, and learned the German and Italian Armies were in rout. The battalion set a record for repair-

# ClassNotes

ing tanks. During one month, its tank repair company disassembled 28 battle-damaged M-3 tanks, overhauled their radial engines and dynamometer-tested them, repaired or replaced all damaged parts, re-installed the 75-mm guns and their gyrostabilizers, overhauled and reinstalled the machine guns, and returned the tanks in working order to combat troops.

The combat troops moved rapidly west past Benghazi and Tripoli to Tunis—too far for our non-mobile shops to be useful. The battalion was ordered to England to prepare vehicles for D-Day, and I went with it. However, Bud Shank and Newman Marsilius had acquired knowledge especially valuable in the Middle East and Far East. They were reassigned and I didn't see them after 1943.

During the 50 years after World War II, Newman Marsilius established corporations in Connecticut. Bud Shank earned SM and ScD degrees at MIT. As professor, he taught for years at MIT in Courses III and XIX, and retired with honors as professor emeritus. One evening in 1994 Bud and **Hans Bebie** attended an MIT meeting in Seattle and my name came up. That led Bud and me to exchange letters. Last month Bud brought his wife, Virginia, to Tacoma where I saw Bud for the first time in 52-plus years. Stimulated by photos we took in Aberdeen and Egypt, he and I reminisced. Hilda and Virginia, being perfect wives, mostly listened and then commented that some of our retellings bordered on the "believable."

**Julie and Charles Wang** write: "...We just returned from Shanghai, China. We were there during the Christmas holidays and stayed for two months. We attended a meeting of the MIT Club of Shanghai, but not many came." . . . **Franklin Bent** retired in Wilmington after a career in operations and engineering with Hercules Corp. Frank still receives invitations to consult, but his interest these days is drawn to a grandson who is about to receive a degree in agriculture administration and who has his first post-college job three months before graduation. . . . **Martin Lindenberg** is a substitute teacher in North Dartmouth, Mass., high schools. Mary's painting "Autumn in Vermont" was used by American Press (New Bedford) for its 1981 calendar, and drew so many compliments that it was published again in 1995.—**Hal Seykota**, secretary, 2853 Claremont Dr., Tacoma, WA 98407

## 40

You are probably reading this shortly after the conclusion of the great 55th Reunion. I am sure all those who attended had a fine time, and are happy to have participated. Already a mini-reunion before the 60th regular reunion is under discussion. Consideration of a possible location—East Coast, West Coast, or other—is becoming a focal point. **Sam Card** and **Dick Babish** both mentioned the West Coast. **Norm Klivans** leans toward the East Coast. Fortunately, there is plenty of time to resolve the issue.

**Reid Weedon**, '41, sent word to the Alumni/ae Office of the death of **William L. Sweet**

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of Fort Wayne, Ind., on November 3, 1994. Reid wrote that Bill died peacefully after suffering for about a year with a blood disease that left him subject to infection. Reid commented on what a caring and thoughtful man Bill had been.

Frank Libman called recently to learn when the paperwork concerning the reunion would be sent, as he planned to be away for the month of April. He told me that he had visited in India last year with Shashikant "Pat" Pat-tani. Pat and Frank had nearby rooms in the dorm in the early years, but Pat did not stay on to graduate with the class. Frank had also visited in Chicopee, Mass., with John Kapinos.

Please send me your reactions to the reunion and any thoughts you may have toward the next one. Write or call Richard E. Gladstone, secretary, 250 Hammond Pond Pkwy., 1205S, Chestnut Hill, MA 02167-1528; (617) 969-5161.

## 41 55th Reunion

We have received additional information about Johan Andersen, whose death on February 2, 1995, in Sarasota, Fla., was reported last month. He was a business man, inventor, engineer, and sculptor. He lived in Hopkington, Mass., most of his life, but upon retiring in 1971, he lived half the year in Gilford, N.H., and the other half in Grenada, Windward Islands, West Indies. He is survived by his second wife, Barbara, a son, two daughters, three stepdaughters, and four granddaughters. His classmates express sympathy to his family. Classmates' memories and class records provide more personal details. *Technique 1941* shows Johan to be a member of Course XV, Phi Gamma Delta, the Dean's List, Elections Committee, and Walker Memorial Committee. He was also a Field Day manager, usher, and gym manager. During the war years, he was a research associate in the Chemical Warfare Service Development Laboratory at MIT. In his 25th and 50th Reunion biographies, he continues the account of his early years after graduation: "In November 1946, my brother Tom and I decided to start Duplicon, a metal stamping business in a cow barn in Hopkington, Mass. It grew to two plants with 150 workers. Sold out in 1969. Retired to live in Grenada in 1970. We enjoyed a lot of good people, helpful advice, hard work, and a good profit-sharing plan. I was happy when a guy walked in the door in 1969 and said, 'We want to buy the company.' We also remember his description of his 'Cave House' in our 25th Reunion yearbook. Here he describes how a very talented, non architect, MIT graduate approaches and solves the problems of building an underground house in a very beautiful but strange environment. This account conforms with my memories of 'John,' as we called him at the CWS Lab. His classmates are reminded that in August, a memorial service will be held at his home in Gilford, N.H.

Hank Avery responds to my recent plea: "I just read the February/March *Review* and as our secretary for 20 years, I understood your frustration of waiting for a fatter mail bag." He encloses a clipping from *The Florida Times Union*, headlined "Angels For Entrepreneurs."

It is a follow-up on our May/June 1994 report on Hank and his brainchild, the non-profit organization, The First Coast Venture Capital Group. The group isn't a fund and doesn't make recommendations. It is a conduit for investors, called "angels," and entrepreneurs. The group of 60 members has survived its first year and is still expanding. It holds monthly breakfast meetings featuring a keynote speaker and at least one business presentation by a hopeful entrepreneur. Presenters have included pharmaceutical and medical companies, high-tech firms, a small brewery, and a building-products company. The most recent was a presentation by Pensacola entrepreneur, Kathie Kidder Jones, selling her proposed venture, Urinette, Inc. The proposed product contact-free fixtures called "She-inals" for women to use in public restrooms. She hopes her energetic presentation, using tastefully illustrated charts, will lead to an "angel." Florida has not typically attracted venture capital to fund high-tech business and the associated jobs. Hank's organization is an effort to facilitate this process.

James A. Creighton writes on his alumni/ae contribution form: "Enjoying life on the coast of Maine. Still working on drunk driving and seatbelt laws as a member of the Maine Highway Safety Commission. Also active in tennis, golf, sailing, birding, and bridge. Have invented a new duplicate bridge game to be marketed shortly." . . . On a similar form, Bob (Wallace) Blake provided a better summary of his last summer's trip to France and Spain than appeared last month. I should have waited! . . . Chet Hasert, as predicted, is appearing at his usual haunts under his own leg-power. His new left hip seems to be eminently successful! . . . Reactions have been favorable to Sterling Ivison's suggestion of Martha's Vineyard as the site for our 55th. . . . Sepp Dietzgen is continuing to investigate with MIT.—Charles. H. King, Jr., secretary, 7509 Sebago Rd., Bethesda, MD 20817-4839

## 42

Lou Stouse, our class agent, says that if you haven't sent in your annual contribution, please do it now! Lou and his wife, Kate, traveled to Bali, Java, Singapore, Malaysia,

and visited their daughter and her family in Perth, Australia, in March. More of that trip when I hear from Lou.

Jean and I met two classmates, Ben Skinner, who lives in Dunedin; and Ken Leghorn, who lives in Sarasota, at the MIT Club of Tampa Bay meeting held at the Fine Arts Museum in St. Petersburg.

Ed Thode, from Las Cruces, N.M., writes that he and Isobel celebrated their 50th wedding anniversary with the entire family attending, in July. All three children followed in Ed's footsteps, becoming published authors. He also wrote that Sutton Munro passed away in Vermont early in March. Ed and Sutton taught together at the University of Maine in the 1940s. Condolences to the Munro family.

We have news from Cart Laffoon by way of Lou Rosenblum. Helen and Cart spent a week on Cape Cod last fall to see the autumn colors there. Also visited with Flora and Maury Taylor when they were on the West Coast. From Lou's letterhead: his Apple Link is D2628 and his e-mail address is <lrosen24@aol.com>.

Any old fashioned classmates can still phone him at (617) 484-9005.

**Al Root** is "in the surprising experience of downsizing" and hoping to catch up by next year. After 50 years in Delaware County, Pa., Madeline and **Harry Clarke** have moved to a retirement village in Neffsville, Pa. They extend an invitation to all to visit them there.

Two obits: **Herman Lorence** died in September. He was cremated and his ashes were scattered at sea from his boat, *Witch of Endor*.

... **Stuart Dunham** of Course IV, passed away at Schenectady, N.Y. Condolences to their families.—**Ken Rosett**, secretary, 281 Martling Ave., Tarrytown, NY 10591

# 43

Gulfport, Fla., realtor **Bob Caldwell** reports the death of **Robert E. Hewes** (Course XVI) in St. Petersburg, Feb. 14. A native of Beacon, N.Y., Robert attended Bowdoin

College before getting his degree at MIT. During World War II, he served as an experimental flight engineer with military aircraft. He was a registrar and director of institutional studies at MIT and a member of the American Association of College Registrars and Admission Officers. At UConn., he was dean of student affairs and later head of the Academic Computer Center. In St. Petersburg, he belonged to the Academy of Senior Professionals at Eckerd College and assisted with classes in computer science and Western heritage. We extend our condolences to his wife Arlene and to the other members of his family. . . .

**B. David Halpern** and his wife, Ruth, of Jenkintown, Pa., have recently returned from Bangalore, India, where Dave served as a volunteer with the International Executive Service Corps. A chemical consultant and retired head of Polysciences, Inc., he assisted Southern Herbals Ltd. in the development of a process and plant to extract anti-cancer drugs from plants indigenous to India. Polysciences, under contract to the National Cancer Institute, was a pioneer in the large-scale isolation of these drugs from plant sources.

Send some news. Even if it's bad, I promise not to shoot the messenger.—**Bob Rorschach**, secretary, 4727 S. Lewis Pl., Tulsa, OK 74105-5138

# 44

We are saddened by the death of **William D. Bowman**, Course II. He died of a heart ailment on January 15, 1995, at the Henry Ford Hospital near his home in Detroit. Bill

was born in Houston but grew up in Youngstown, Ohio. He was with us at the start of our 50th Reunion on May 27, 1994. Like several of our classmates, Bill delayed his education so that he could work and save to pay for his tuition and expenses at MIT. After graduation in February 1944, he worked for the Budd Co. and the NACA-Cleveland Facility before settling at the Ford Motor Co. He stayed at its Dearborn Engineering and Research Center for 31 years before retiring in 1981. Bill married Charlotte Novak in 1953, and is survived by her and a brother. Burial

## ClassNotes

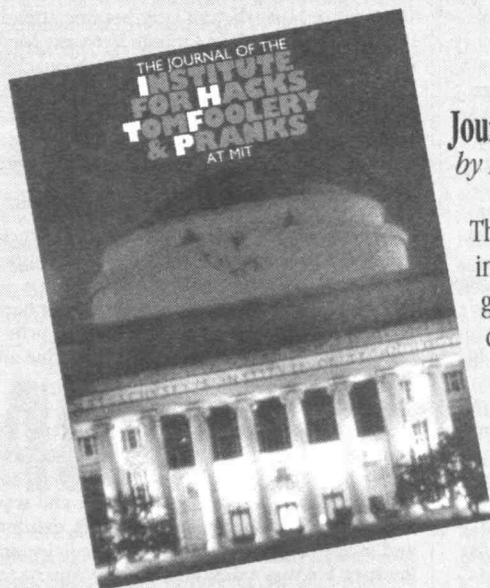
was on January 18, 1995, at the Tod Homestead Cemetery in Youngstown. Our condolences go to Mrs. Bowman.

Since this is the 50th Anniversary of the end of World War II, I decided to report on some events of my U.S.-sponsored leave from MIT. If you would like to add your tales, Lou and I will work them into our columns.

After Signal Corps OCS on May 20, 1944, and two months of specialty training (mine was wire/telephony), **Emil DeAgazio** and I were assigned to the 3170th Signal Service Battalion at Sea Girt, N.J. In late August, the battalion left by troop train for Camp Stoneman, Calif. Soon we were on board a troop ship bound for Brisbane, where shore leave was promised. The ship was the *Lurline*, then the largest passenger ship of the Matson line. There were over 4,000 assorted troops on board. The ship traveled alone, as was the practice. Three weeks later and about 12 hours from Brisbane, the ship abruptly changed course and headed northward. I thought it was just another evasive action. Next morning, "Now hear this!" announced that Brisbane was out and Milne Bay, New Guinea was in.

After a brief stop for transfers of troops and supplies, such stops were repeated at Oro Bay and Finschhafen. After a month on board, we debarked at Hollandia (now called Djajapura),

**Hack** \hak\ *n* 1: A prank, usually elaborate. *v* 1: To perform a prank. 2: To explore the places on campus that are not usually accessible. 3: To work at or study a subject not especially for academic gain.



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and headed for the staging area up in the highlands.

At Camp Washington we spent over two months drawing arms, equipment, and supplies. Just after New Year's, we were split into two groups, a smaller advance party of less than 100 and the rest of the battalion. Lucky me and my teams were loaded onto LST 210 for the landing at Lingayen Gulf on D+2. The rest of the battalion and Emil would go in on D+4.

We landed, as scheduled, on January 11, 1945. Fortunately and inexplicably, the enemy had not fortified nor defended the beaches. There did not seem to be any confusion, but there was much commotion as more combat troops landed and moved inland. We spent the night on the beach as the Navy ships fired into the hills about 5 to 10 miles away. In the morning, the infantry had secured our bivouac area and we moved in. The next day, the rest of the battalion joined us. We would provide the communications services for Base M. A two story house in the nearby town of San Fabian was used for the telephone central, called the Mission Exchange. The mainframe and cabling were in the lower level while the test equipment and switchboards were in the upper level.

During the first month, there was bitter fighting in the hills, particularly at Rosario, the southern gateway to Baguio via the Kennon Trail. In a short period of two days, Quartermaster had to use ponchos and mattress covers for the bodies. We supplied the field wire for tying them. I can still visualize the lush rectangular outlines in the temporary cemetery across the road from our camp. Meanwhile, the First Cavalry with light tanks sped south on a critical mission. They succeeded in freeing the civilian internees at Santo Tomas University. They had been imprisoned for 37 months and were suffering from malnutrition and mistreatment. The adult male average weight was down to 112 pounds. At an initial count of almost 5,000, they had dwindled to less than 4,000. The rescue was completed on February 5. We also learned that LST 210 had been sunk at Subic Bay.

As the infantry made progress, Base M moved north to San Fernando, where there were dock facilities. Emil and most of the battalion made the move, and we all became part of the 4025th Signal Service Group. The original advance detachment stayed at San Fabian and became the 25th Platoon. Lingayen Gulf is rimmed by beautiful beaches, wide and sloping gently, fit for LST operations. About 10 miles north of San Fabian was the Alacan tank farm. It was barely damaged. The coast road ran by San Fabian, Alacan, and Bauang to San Fernando. Bauang was the junction of the mountain road to Baguio. The gulf was a good staging area for the invasion of Japan.

On the beach between San Fabian and Alacan, an open ammo dump was set up. It was a big mistake. One moonlit night, a lone Zero came in low and dropped a bomb. He hit the jackpot. The chain explosions resounded all night, lighting the sky sufficiently to play a ball game. A day later, after the road was reopened, we went there and saw blackened tree stumps and large burnt splotches on the sand. All ammo had been destroyed.

After V-E Day, living and eating conditions improved. As the Signal unit responsible for the distribution of Hollywood films, we were favorably treated by Quartermasters and Engi-

neers. We often had seconds on steaks and cutlets, as well as ice cream. Mostly we had to contend with the weather, for it was now the rainy season. Like clockwork, rain would start daily at 1600 and last until early the next morning. Soon after V-J Day, I got a call from Bauang. It was **Lou Demarkles**. He was on a one-day stopover from Europe to Japan. I drove up and spent the afternoon exchanging stories about our happenings.

In October, we were told that we would not be going to Japan. I was very disappointed. Remembering that the enemy's atrocities predate Pearl Harbor, I sorely wanted to do to the Imperial Palace Garden what General Patton had done to the Rhine. I still feel frustrated. Sub-base M would be closed followed by Base M. All personnel would be reassigned or rotated home. Meanwhile we had time for leisure.

I toured the Kennon Road. It ran along a gorge and was once a trail used by mule trains from Manila to supply the garrison at Baguio. There were still stone huts, spaced a day's march apart for use as the trains' shelter. This road rose steadily but not steeply, unlike the steep mountainous road from Bauang. About halfway along the trail, the gorge opened into a vista of rice terraces, which rose for thousands of feet. Over generations, the native tribes had constructed them with only simple hand tools. The various tribes were collectively called the Igorots. They would come into the towns with their surplus produce and barter for other necessities including dogs. No festival was complete without a dog as part of the feasting. It was considered a delicacy. Its culinary preparation was elegant in its logic and simplicity. (I omit its description in deference to one's sensitivities.) Farther along, the approach bridge across the gorge had been destroyed, so I did not reach Baguio by this route. The city sits in a bowl, 4,000 feet above sea level, hot in the day and cool at night but always with low humidity.

In January I was ordered to the Manila Signal Corps Training Center at Caloocan. I was to become an instructor. There, I joined **Bob Clarke** and **Newton Teixeira**. A week later, Emil arrived. In the spring, we had our own mini-reunion when **Stan Berinsky** and **Pierre Dube** visited us in transit from the CBI Theater to Japan. In July, all four of us were ordered home. At the replacement depot, we met **Larry White** who came home with us.

I did not know until last year that **Holton Harris**, **Norm Sebell**, and **Stan Warshaw** had been in the Manila area. In addition, **Jim Leonard** and **George Wilson** also had come up the coast of New Guinea to the Philippines.

Years later, I met the former engineering officer of LST 211. He told me that 210, 211, and 212 were beached side by side at Subic Bay. That night, two mosquito boats sped in and sank 210 and 212. They were on the outside. More years later, I was returning home from Dallas and boarded a transcontinental flight. I sat next to an Indian lady who was going to Washington. Her husband, a diplomat, had been assigned to Manila in the '60s. She told me that the bridge into Baguio had not been rebuilt at that time. Even more years later, one of my new programmers whose father was a regular in the Army, told me that the bridge had finally been rebuilt. Air-conditioned buses made scheduled trips between Manila and Baguio via the Kennon Road. It's

a small, small world indeed.—Co-secretaries: **Louis R. Demarkles**, 77 Circuit Ave., Hyannis, MA 02601; **Frank K. Chin**, 221 St. Paul St., Brookline, MA 02146

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Please send news for this column to:  
**Clinton H. Springer**, secretary  
P.O. Box 288  
New Castle, NH 03854

46

## 50th Reunion

Our reunion chairman, **Bob Hoffman**, reminds us of our upcoming 50th Reunion June

6-12, 1996. Tech Week events will be on campus June 6-9, and our reunion will continue in Newport, R.I., June 9-12. By now you should have received information and a questionnaire from **John Maynard** and **Dan Cooper**. If you have not received this information, please let us know.

**Jim Ray** is retiring as our class secretary, and **Glen Dorflinger** has asked me to be the new secretary. We thank Jim for his many years of fine service to the class. I urge you to write or call me with news about yourselves for this column.—**Ned Tebbetts**, secretary, 9 Jerusalem Road Dr., Cohasset, MA 02025-1110; (617) 383-1662

47

**Peter Poulos**, MD, died in December 1994 after a long and distinguished career. He had practiced thoracic and cardiovascular surgery for 32 years. He pioneered in open

heart surgery and designed equipment and surgical instruments for procedures he developed. He was attending surgeon, scientific and surgical director at the Heart Institute at United Hospital in Newark, and later became attending surgeon at the East Orange Veterans Medical Center and thoracic surgeon at Newark City Hospital, St. Elizabeth's Medical Center, Elizabeth General Medical Center, and Alexian Brothers Hospital. He also was attending thoracic and cardiovascular surgeon at Babies Hospital, Presbyterian Hospital, and St. Michael's Medical Center, all of Newark. Poulos was an instructor in physiology at Cornell Medical College, assistant professor of surgery at Seton Hall College of Medicine, South Orange, associate professor of surgery at New Jersey College of Medicine, and clinical professor of surgery at University of Medicine and Dentistry of New Jersey in Newark.

In addition to degrees in engineering and medicine, Poulos graduated from Rutgers University School of Law in 1989 and passed the New Jersey bar in 1990. He was founder and director of the Medical Law Institute and was involved with numerous publications, exhibits, and incorporated publications of medicine and lawyers. He was a diplomate of the American Board of General Surgery and of the Board of Thoracic and Cardiovascular Surgery and was a Fellow of the American College of Surgeons, the College of Chest Physicians, Society of Thoracic Surgeons, and the American Society of Law and Medicine. Dr. Poulos served as a

first lieutenant in the Army Air Force during World War II. He was a B-24 pilot for the 8th Air Force, flew 34 combat missions, and was the recipient of the Air Medal with Oak Leaf Clusters. Surviving are his wife, Helen, two sons, two daughters, his mother, a brother, and three grandchildren.

We had a nice letter from **Lena Sutera**, now **Lena S. Norman**, in Saginaw, Tex. Lena retired from Menasco Systems in Euless, Tex., in 1990. That gives her time to pursue her interests in painting, sculpture, photography, poetry, gardening, and quilting—as well as her “almost addictive interest in Scrabble.” Last year Lena copyrighted a collection of her poet-



**Lena Sutera Norman, '47, (left) is presented with an award by Composers, Authors, & Artists of America President Roberta Bowman.**

ry, *An Armful of Poetry—Hold it Close to Your Heart*. And, in May of last year, she received a literary award from the Composers, Authors, and Artists of America.

**Hugh Flomenhoft** is still active in Florida—he is serving as president of the MIT Club of the Palm Beach Region for the second time. President Vest was a guest of the club in January and gave them an update on the Institute. Hugh tells us his son, Gary, is building electric-powered cars and tractors in California. He recently completed an electric version of the 1955 Porsche Spyder, capable of over 60 mph and with a range of 60 to 100 miles.

Two very brief notes: **Harold Raiklen** is continuing his studies and slide presentations: *Jews of Dynastic China*. He's preparing to expand to *Jews of Modern China and of Asia* (with the exception of the Middle East). . . . **Eugene Woestendiek** simply says, “I am now retired!” Tell us more, Gene!—**R.E. “Bob” McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

# 48

**Bob Crane** retired from Sterling Drug in 1989 where, as director of clinical research, he had been setting up and evaluating trials of new pharmaceuticals all over the world.

For the next four years he consulted for the company. Since 1993 he has been a busy volunteer as co-chair of Project MEDS which provides education for seniors about their medications. Project MEDS provides lectures, individual counseling, and screening tests. Bob enjoys working on his computer—which he uses extensively. He is preparing a manual on what they have learned during Project MEDS

and plans to distribute it throughout Texas as well as nationally. Bob is also a member of a support group that visits patients before and after surgery. He publishes the group's newsletter.

Bob has had bypass surgery twice, prostate cancer surgery, and anemia. He walks at a mall five mornings a week (with the help of nitroglycerine). Bob and his wife, Jonny, are planning a trip to Atlantic City High School, for Bob's 50th Reunion. Another trip to the Pacific Northwest is planned. Last year they took a three-week trip via Eurailpass from Brussels to several European cities.

**Gordon Johnson** has lived in the same house in Alexandria, Va., for 32 years. He had been CEO of LogEtronics in Springfield, Va., which makes prepress equipment for the printing industry. After retiring, he spent five years as deputy director of the Center for Privatization advising developing countries. He is “mentoring” a local startup company making bar code management information systems for printers. He has done some seminars for CIS and other countries on privatization and corporate governance at the International Law Institute.

**Fritz Dunmire** died in March. His wife, Marge, called with the news. The class records showed they attended four early reunions. Marge remembered the 10th in the Berkshires, the 15th on the Cape, the 20th on Martha's Vineyard, and the 25th on campus. Fritz enjoyed sailing, had his own boat, and was commodore of the Centerport Yacht Club. For 30 years, he also crewed for Jack Saxe, '49, in local races. Fritz and Marge had been living in Centerport, N.Y., for the past 40 years. He had been with Grumman for 40 years and worked on the Lunar Module (LEM) for the Apollo project. They have three children and four granddaughters. On behalf of our classmates I extend our sympathy to Marge and her family.

April 6th was the 50th anniversary of yours truly receiving a letter from Dean Thresher accepting me as a freshman. I had an interview in the Dean's office several months before being accepted. To celebrate being accepted, I asked the current dean of admissions, Michael Behnke, for the use of his office on April 6, 1995. Michael is still using the same desk in the same room used by Dean Thresher. I invited two friends and four students to join me as I reminisced about applying to MIT. In addition to hitchhiking to Boston for the interview in 12th grade, I had written George Dandrow, honorary secretary, for an interview when I was in 8th grade. (He didn't find out my age until I walked into his office at Johns Manville headquarters on 40th St. in NYC.) George had filed a report of the interview and when I spoke to Dean Thresher, he had his secretary retrieve the earlier report and attach it to my application. When Dean Thresher learned I would need financial aid but had no appointment to see Dean Pitre, he called Dean Pitre and within the hour Dean Pitre saw me. This led to a \$300 scholarship for the first year

# ClassNotes

which was half of the year's tuition. Great memories and wonderful feelings.—**Marty Billett**, secretary, 16 Greenwood Ave., Barrington, RI 02806; (401) 245-8963

# 49

As I write (March 11, 1995), I have before me an article from the Business section of today's *Boston Globe* which states that Amp, Inc., of Harrisburg, Pa., has acquired M/A-Com of

Lowell, Mass. On news of the deal, M/A-Com's shares rose 43 percent in heavy trading. Amp makes electrical connectors while M/A-Com makes components for wireless devices including telephones. What makes this story relevant to '49ers is the fact that **Harold McInnes** is chairman of the executive committee of Amp, Inc., and the news about Amp these days is pretty spectacular. Last year, according to the article, Amp reported sales of \$4 billion. I also read recently that Amp has glowing prospects for expansion in the European market.

I have often wondered what the result would have been if word processors had been available to authors like Shakespeare, Tennyson, Dickens, et al. Certainly, writing, rewriting, erasing, correcting, revising, and editing would have been faster and easier for them compared to using the scratchy ink pens which were state of the art in their day.

Which brings me to **Al Kenrick** who is about to do for writers in Japan and China what a word processor could have done for Shakespeare and company. Given that there are some 3,500-plus characters or ideographs in the oriental languages, Al is well along with a processor which permits significant increases in output for Asian writers. Using ideas perfected by Reynold Johnson, a prolific inventor, the heart of Al's system is a “user friendly” keyboard coupled with a garden variety IBM PC. But this “keyboard” isn't the familiar IBM variety. Rather, (and Al's corrections will appear in this column if I am wrong), it is like an XY plotter where the “pen” is moved around by the user. But this “pen” is not really a pen but a scanning “eye.” Under the “eye” is a chart showing all 3,500-plus ideographs of the Japanese, Chinese, Taiwanese, Korean, etc., languages. (That's a rectangular array of approximately 60x60 characters, easily displayed, without crowding, on a sheet smaller than a piece of typewriter paper.) The user positions the “eye” over a desired ideograph, punches a key, and the chosen character appears instantly on the computer screen. An experienced user can “type” at a rate of one character per second. Later, the text is printed on an ordinary printer directed to print left to right, right to left, or top to bottom. Given the vast size of the Asian business equipment market, Al feels that his product offers a multi-billion dollar opportunity for a growth oriented major manufacturer with a long term strategy for Asia.

**George H. Ray**, 67, a graduate of Course VI, died on January 20, 1995. George had his own business, Electro-Optic Devices, in

1927-1995

**WILLIAM H. RAMSEY, '51**

## Effective Leader—Caring Mentor

**W**illiam H. Ramsey, '51, mentor and role model to hundreds of students as executive director of engineering special programs in the School of Engineering since 1988, died January 14 at the age of 67.

Ramsey's post involved administering the Engineering Internship Program (EIP) in which MIT students combine their academic program with on-the-job experience, and the Minority Introduction to Engineering and Science program (MITES). Now in its 21st year, MITES brings 35 to 50 high school students who are interested science and engineering to MIT each year for skills training.

"After a distinguished career as an engineer, manager, and businessman, he returned to the Institute not only to work but to serve," said Associate Dean Arnold R. Henderson, Jr., at a memorial service at MIT in March. Ramsey's dedication was especially evident in "his efforts with the students and staff of the MITES program," according to Henderson. "He justifiably expected much from his students: hard work, self-discipline, and commitment, [but] he also made a strong effort to create a warm nurturing atmosphere. . . .

I admired his willingness to give so much of himself to these very promising candidates, especially at a time when too many in our society look upon the young as a burden rather than a precious natural resource."

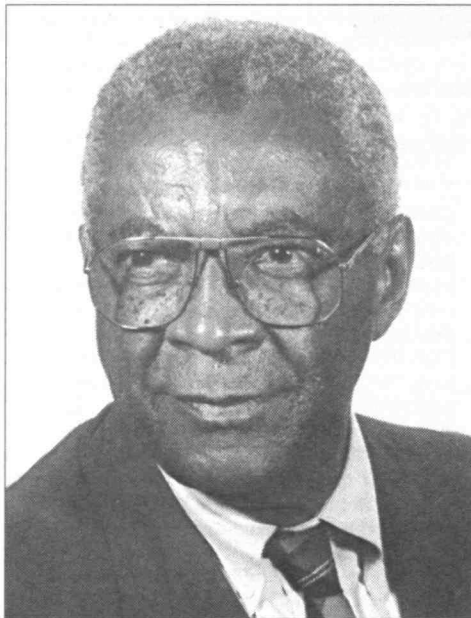
MIT President Charles M. Vest commended Ramsey as "a dedicated and effective leader of educational efforts" and a "very warm and caring mentor" to the students in these programs. "Their success and contri-

butions to society are Bill's legacy."

"We will remember him best for his sense of humor, his devotion to his family and his church, and his wonderful smile when the topic of St. Kitts came up," said Joel Moses, dean of the School of Engineering. Ramsey had planned to retire this summer to a home he and his wife had built on the Caribbean island.

A native of Brooklyn, N.Y., he graduated from Brooklyn Technical High School and received an SB from MIT in electrical engineering. Ramsey spent 20 years in military electronics as a circuit designer, systems engineer, and manager, and 15 years in management consulting, including the vice-presidency of Ault, Inc., an electronics firm in Minneapolis. He returned to the Institute in 1987, and for the first year served as an officer in the Industrial Liaison Office, where he was responsible for research interactions between MIT and 18 companies in the U. S. and Europe.

At the time of his death, he was a board member of the Massachusetts Society for the Prevention of Cruelty to Children. He was a former president of the board of the City Mission Society in Boston. □



WILLIAM H. RAMSEY, '51

Waltham, Mass., specializing in fiber-optic cable design and amplifiers. He is survived by his wife, Martha, four children, a brother, a sister, and five grandchildren. I know I speak for the class in extending our deepest sympathies to the family.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192; (617) 449-1614

**50**

I write this in late February for you to read in July, so by the time you see it, our 45th Reunion will have come and gone. To all who attended, the committee thanks you and

hopes you enjoyed it.

**Hank Sharp** did not plan to attend because

his financial services company has business meetings in Newport frequently. I shall have to wait for the 50th. Where would you select, Hank? . . . While composing these scribbles, I got a call from **Roger Milligan** in Bedford. He planned to attend the reunion, which cheered me. Roger retired a year ago from Kaman Avidyne, an aerospace company. He keeps active playing tennis and enjoys his six grandchildren. . . . I finally caught up with my Field Day football teammate, **Louis Young**. Lou had just returned from traveling for Black History Month. Lou was a Tuskegee Airman in World War II and is in demand as a speaker. BAMIT plans to have him speak on the Saturday after Technology Day. Lou retired from Lockheed in 1989 and is VP of the local Tuskegee Airman chapter. Their main activity

is scholarship awards, 36 a year. Lou has traveled extensively in South America. He plans his next major excursion to South Africa.

I am happy to report there is no sad news this issue.—**Robert A. Snedeker**, acting secretary, Seven Mashie Way, North Reading, MA 01864; (508) 664-1738; **John T. McKenna**, P. O. Box 146, Cummaquid, MA 02637

**51**

### 45th Reunion

While still head of his company, Electronics Marketing Associates, **Marv Grossman** is also spending a great deal of time at Harvard under a grant devoted towards developing

model curricula for high school science courses. It is not all work for him as he and his wife, Joanne, went on a trip to Australia. On the way there, they visited their daughter and grandchildren in California.

Keeping at least as busy as he was prior to retirement, **Herb Scher** and his wife, Marilyn, have been doing an extensive amount of traveling. Last year, Herb and Marilyn escorted members of their family on a tour of Italy acquainting them with many of the art treasures about which they have become so knowledgeable during previous visits. This year, they are traveling out west to the Grand Canyon. Later on, they will be going on a trip taking in Stockholm, Copenhagen, and St. Petersburg. Herb is a member of a number of the boards of many of the cultural activities in Baltimore. He is also doing volunteer work with the Jewish Vocational Service in Baltimore—showing them how to make use of the Internet in locating potential employment opportunities for those that the service assists.—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368

# 52

**Marty Sack** writes "I attended our 40th reunion with a lovely, wonderful woman, Lenore. After five years together, we got married a year ago, and now we have a blended family of seven children, all of them of marriageable age and only one, my oldest daughter, married. So far we have no grandchildren. We still live in Washington, D.C. Only one of our children, Lenore's older son, lives in the area. Lenore's daughter is in San Francisco, and her younger son is in the Boston area. Both my sons are in the New York City area, my younger daughter is in Nashville, and my oldest daughter volunteered for the MBA Executive Corps and is working for an Estonian company in Tallinn, helping it become part of the capitalist world." By the time this reaches print, Marty expects to have completed a trip with Lenore to Budapest, Prague, and Vienna, followed by a visit by Marty to Tallinn to see his daughter. Marty is a program director for operations research at the U.S. Postal Service. He wrote to me, by the way, by e-mail.

Writing with conventional media, **Amos Dixon** says that he will be retiring this summer after 40 years since his first job out of MIT. He has worked at various petrochemical plant jobs for Goodyear, B. F. Goodrich, and Geon in Akron, Beaumont, Texas, and since 1969, in Plaquemine, La. Amos and his wife have five children and nine grandchildren. They plan to spend their summers at Amherst Shore, Nova Scotia, where Amos says he has a family compound "which may be bigger than the Kennedys have in Hyannisport." He intends to work on getting his golf handicap below 14, and tasting lobsters fresh out of the ocean.

I am grateful to **Art Turner** for sending me a magazine clipping that describes how **Swraj Paul** came to buy and reopen a closed steel mill in Sharon, Pa., to supply his North American pipe manufacturing business, thereby returning 500 jobs to a depressed region. Swraj has similar businesses in the U.K. and India, and is also involved in public service activities such as serving on the board of a

school. Of course putting 500 people to work might fairly be described as a public service, too. At the time last February when I wrote a note to Art thanking him for sending the clipping, I was buoyed by a short spell of good weather, and mentioned the many blossoming plants in the area where I live. What I did not say was that there had been so much rain that there was little opportunity to enjoy them; and the following month was worse. I feel as though I have missed a season.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301; e-mail <lacey@hpl.hp.com>

# 53

Beginning with the August/September 1994 issue of *Technology Review*, each of my columns included a rather desperate plea for more information from you folks. But, sadly, my pleas generated only nine responses (sent via MIT or directly to me) during the intervening seven months. This is hardly sufficient information to allow a class secretary to write an interesting column, much less one worthy of a Pulitzer Prize. As a consequence, my failure to generate a suitable amount of interest in the Class of 1953 column leads me to conclude that I should resign as class secretary and thus I do so. However, as a final act I include below the bits and pieces of class news which are available to me.

**Allan Hoffman** sent a note from Seattle (he doesn't say so, but I presume he is still a professor at the University of Washington): "The only news is an update on the Festschrift published in the *Journal of Biomaterials Science* in honor of my 60th birthday (in 1992). There have been eight issues, the last was late this year and over 60 papers total. A book will be published with all the papers in 1995." . . . **Albert Reynolds**, now living in Charlottesville, Va., and a professor of nuclear engineering at the University of Virginia, spent half of 1994 on sabbatical in Paris. He worked for the French company FRAMATOME, which designs France's nuclear power plants.

**George Wood** has retired from Digital Equipment Corporation and is now in business helping single parents collect "court-ordered child-support payments." In this latter activity, he is senior counselor to the U.S. Child Support Recovery in Rye, N.H. . . . **F.R. Toline** (a.k.a. Doc) kindly wrote: "This is an attempt to stave off your resignation. I have been retired the second time for 14 years, but I really don't have the time for this." Doc was a 35-year-old naval aviator when he completed his degree and then went on to become head of the Air Launched Missile Propulsion Branch of the Bureau of Naval Weapons; he retired from the Navy in September 1960. He then taught aerospace and nuclear engineering at Tennessee Technological University for 21 years, retiring in 1981. Appropriately, he has two retirement titles: CDR, USN (Ret) and professor emeritus.

Now, as I "retire" after more than two decades of service as a class officer, I do hope that my successor, **Joseph Cahn**, will enjoy the service as much as I have but, in addition, gain more class support in the process. Send your news to him at 20 Ocean Park Blvd., #9, Santa Monica, CA 90405-3557; tel: (310)396-6322, fax: (310) 553-0687; e-mail: <jmc20@aol.com>.

## ClassNotes

My best wishes to all my classmates; do drop by or call if you are in the Washington, D.C., region.—**Martin Wohl**, former secretary, 4800 Randolph Dr., Annandale, VA 22003; (703) 354-1747

# 54

**Zdenek Stekly**, who is chairman of the board and technical director of Magnetic Corp. of America, is among the scientists and engineers who have contributed to a recent two-volume treatise entitled, *Intermetallic Compounds—Principles and Practice*. The work is intended to provide state-of-the-art assessments of theory, experiment, and practice for intermetallics and serve as an aid to both scientists and engineers.

That is the extent of the news that we have. Drop me a line so that everyone will be up-to-date on your current activities.—**Edwin G. Eigel, Jr.**, secretary, 33 Pepperbush Ln., Fairfield, CT 06430

# 55

By the time you read this, we will have had our 40th Reunion in Prouts Neck, Maine, and many of us will have gotten up to date on each others' activities. For the sake of those who couldn't make it, however, we'll be reporting as much as we could pick up from the reunion attendees over the next few months. Also, of course, we'll continue to report on the material we receive from the Institute and from you directly. So please keep your notes and letters coming so that we can stay in touch as much as possible with all of our classmates.

Isn't it amazing how strange things happen to us as we pile on the years! **Vladimir Chernyshov** (Course VI) writes that a couple of years ago, he discovered a half brother he never knew he had in Russia. Apparently Vladimir's father had been married in Russia before emigrating to Yugoslavia after the revolution and never saw his son, whose name is also Vladimir (Dad must have really liked that name!). After World War II, the brother was "given" 25 years behind the Arctic Circle for having been a German Prisoner of War (Stalin never forgave anyone who saw the West, even if it was from a POW camp). Vladimir visited his brother in '93, living near Chechnya, and now wonders whether he should try to visit him again this year.

**Z.J.J. Stokly** (Course II) contributed to *Intermetallic Compounds—Principles and Practice*, published by John Wiley and Sons. It is a 2-volume, 75-chapter, 1,900-page treatise, coedited by two other MIT alumni, Jack Westbrook and Robert Fleischer, both former members of General Electric's R&D Center.

An impressive array of articles on optical instrument design was received from **Roger Reiss** (Course II). They were published in *OE Reports*, a journal of the International Society for Optical Engineering in 1990, and consisted of numerous reviews by Roger of a bewildering

ing variety of precision instruments and related technologies. These were done when Roger was affiliated with the optical sciences laboratory of the Lockheed R&D Division in Palo Alto, Calif. Roger also wrote an article about his experience with a vitreous hemorrhage in his left eye in 1993 when his optical engineering background was helpful to him in selecting the best kind of sunglasses (blue blockers, which are really just yellow filters, and sharp-shooter glasses) to use to maximize his vision. Roger lives in Fort Wayne, Ind.

The Christmas card letter from Marlene and Lee Zuker brought us up to date on their activities. Lee retired from Esterline last June, but within three months of part-time consulting, was asked to run a local company manufacturing kitchen cabinets, "on an interim basis." It is one of the larger companies in this business, making about 30 custom kitchens a day, plus cabinets for baths and other rooms. Quite a transition from an electronics company, but 50 years of home woodworking helped a lot, he reports. At this writing, they're not sure how permanent this may turn out to be. Marlene continues to stay involved as a docent with the Bellevue (Wash.) Botanical Garden and was selected to attend the master gardener program at the University of Washington earlier this year.

John Wing (Course XIII) retired last October after 30 years of management consulting at Booz, Allen & Hamilton, most of which was working with transportation companies and agencies. He was instrumental in starting up their maritime practice and helping it grow to include automotive, rail, urban transit, aviation, and highway clients. Now, he is writing a book and checking up on their four children and eight grandchildren. Wife Barbara (Wellesley '57) continues her active music education and piano performing career (including a wonderful performance of the spectacular Chopin Concerto in E-minor that your co-secretary was privileged to attend), at the Wings home in Bethesda, as well as in Annapolis Md., where John maintains his sailboat.—co-secretaries: Roy M. Salzman, 10643 Montrose Ave., Apt. 2A, Bethesda, MD 20814; James H. Eacker, 3619 Folly Quarter Rd., Ellicott City, MD 21042

## 56 40th Reunion

Nicholas J. Kiladis reports that he is still running the Computer Division at the

Maryland Mass Transit Administration. Also, youngest daughter Lia, a Yale graduate, is currently in her second year of graduate studies in the MIT School of Architecture & Planning.

Send news to co-secretary, Ralph A. Kohl, 54 Bound Brook Rd., Newton, MA 02161; e-mail: <kohl@ll.mit.edu>

## 57

I did not get the last notes out on time because I was busy visiting Kobe, Japan, as part of an NSF post-earthquake investigation team. By the time I got back home and dug out from the stuff that had piled up, the deadline had long passed. As you know from the

newspapers and television, the earthquake did a lot of damage, but it was still sobering to see how extensive it was. In effect, all the major transportation arteries to the west of the city and 181 out of the 187 berths in the second busiest port in Japan were rendered useless.

Phil Presser writes that he is now retired from Rockwell, where he was responsible for the specification, integration, and test of the shuttle navigator. Later he was responsible for developing the integration and test facility for the AC-130U avionics system. Since retiring, he formed a small company that captured an SBIR grant to explore parallel computing architecture, but he has now sold out to his partner. Rockwell had a program that award-



**Joe and the late Mary (Roan) Rocchio, both members of the Class of '57, almost produced an MIT women's gymnastics team all by themselves. For a report of their talented daughters, see page MIT 3.**

ed scholarships to selected retirees to become high school math teachers, so Phil is now a math and science teacher at Mayfair H.S. in Lakewood, Calif.

Peter Kitanidis received one of the 1994 Walter L. Huber Civil Engineering Research Prizes from the American Society of Civil Engineers. . . . Joel Schiffman will retire from the practice of orthopedic surgery in June 1995. He has one daughter in residency in pediatrics and another working as an environmental consultant. . . . David Lukens teaches science and has just been made dean of students at Shimer College in Waukegan, Ill.

Renata Cathou writes, "After a year's 'leave of absence' from my consulting biz, during which the thought of work never crossed my mind, I grasped the obvious and retired. Am now happily and busily doing all sorts of things. I don't see how I ever found time to work before!"

John Hughes of Wellesley, Mass., died on July 27, 1994, after a long bout with multiple myeloma. John was an architect, whose firm, Hughes and McCarthy, specialized in housing for senior citizens as well as office buildings and public safety facilities. He headed the

Metrowest Chamber of Commerce in the late 1960s and was active in town affairs. He leaves his wife, Jean; three children, John III, Minne, and Robert; and a sister, Lois.—John Christian, secretary, 7 Union Wharf, Boston, MA 02109

## 58

A most pleasant dilemma for your secretary this month—how to fit everything into this column! First, a fine example for many of you to emulate.

The letter begins, "I'm a first-time writer, but a longtime reader of the Class of '58 column." Mort O'Connor continues, "I retired from a long federal career last October. After graduation, the Air Force assigned me to the National Security Agency." Additional milestones include converting to a civilian job with NSA, receiving a master's in engineering administration on an NSA fellowship, attending the Federal Executive Institute and the JFK School of Government at Harvard, being a charter member of the Senior Cryptological Executive Service, receiving the Presidential Rank Award of Distinguished Executive and the NSA Exceptional Civilian Service Award. In his last 30 months of service, Mort was an assistant deputy director.

On the personal side, in 1963 he married Harriet Oswald, an Army lieutenant with a BS in nursing from Georgetown University. They had three daughters, the older two, Heather and Lisa, both spent some time in their careers at NSA. Mort writes, "It is comforting that my children now have an idea what their father did." Their youngest, Lorna, was born profoundly retarded and died in November 1994 at age 26. Mort notes that "Harriet was both nurse and mother, ensuring Lorna's happiness."

While on sabbatical Mort was a parent volunteer advocate for the disabled during the '89-'90 Maryland legislative session. He has enjoyed the Washington MIT Club's recent seminar series and for a few years was an Educational Counselor.

Retirement includes overnight cruises in Chesapeake Bay aboard their 26-foot sloop as well as consulting activities based on his expertise in information security. He notes, "We managed to get to one reunion and expect to attend the 40th. Hope to see many of the 515 Club gang." His letter ends with the promise that "I'll not wait 37 years for the next input." Well said and well done, Mort!

An undated press release announces that the White House has appointed architect, urban designer, and preservationist Rex M. Ball to the architect's position on the seven-member U.S. Commission of Fine Arts. The Commission typically reviews designs for national buildings, landmarks, sculptures, parks, and commemorative coins. It also provides general advice to the President and Congress about questions of art such as the authorization of memorials.

Rex is chairman emeritus of HTB, Inc. He has practiced architecture, urban planning, and interior design for more than 37 years. He is active in numerous professional and arts organizations including the Smithsonian Institution, National Trust for Historic Preservation, New York Museum of Modern Art,

American Institute of Architects, Alpha Rho Chi honorary architectural fraternity, the Frank Lloyd Wright Foundation, and American Consulting Engineers Council. He became a Fellow of the American Institute of Architects at age 42, one of the youngest to have earned that honor. He serves as a member of the AIA's Committee on Design.

Design teams under Rex's direction have earned over 50 awards and honors from peers just in the last decade. His professional practice has often involved renovation of buildings such as the National Press Building and Department of Commerce Building in Washington, D.C. He was principal-in-charge for the new terminal building at the San Jose International Airport and the Ministry of Defense and Aviation complex in Saudi Arabia. Trademarks of his design practice incorporate the values of accessibility and orientation to people. Commenting on his appointment to the commission, Ball stated, "This comes as a great honor and recognizes the commitment I have made to the aesthetics and vitality of one of the greatest cities ever built—Washington, D.C."

**John I. Connolly, Jr.**, writes, "Began our new very small defense consulting business in August 1990. Still married to my only wife, Diane, for 25 years. Our only son John III has launched a successful career in music."

**David J. Bentley, Jr.**, VP of RBS Technologies, Inc., Albuquerque, N. Mex., was named a TAPPI Fellow according to a December 1994 news release. TAPPI is the world's largest technical association for the paper and related industries, consisting of 12 technical divisions with over 33,000 members worldwide. A TAPPI member since 1977, David is active in the Polymers, Laminations, and Coatings Division. He was elected to a three-year term on TAPPI's board of directors in 1992. He is chairman of the Technical Operations Council, serves as a *Tappi Journal* contributing editor and has contributed to and edited other TAPPI publications. Prior to joining RBS Technologies in 1992, David held positions at Morton International, Inmont, Union Carbide, was technical director of Kenrich Petrochemicals, Inc., and project supervisor for National Starch and Chemical Co.

Many thanks to our contributors. They report that it's really quite painless. Try it yourself!—**Gary Fallick**, secretary, 4 Diehl Rd., Lexington, MA 02173

# 59

The coming of spring brings only one communication for our notes. It comes from **George H. Connor, Jr.** Since retiring from the Army in 1987, he has received a PhD

in statistics from Memphis State, taught math and physics at the University of Arkansas at Pine Bluffs, and worked as a project manager for Science Applications International Corp. (particularly in Moscow supporting the U.S. initiative in destroying chemical weapons from 1992 to 1994). Now he is again teaching math and physics and coordinating general topics for Pines Technical College in Pine Bluff, Ark.

Thanks, George, for sharing this and providing more evidence that life doesn't slow down at all for many of our classmates.

That's all for now. Again I urge you to *actually do it*—send an update, which will be most

appreciated by your classmates.—**Dave Packer**, secretary, 31 The Great Road, Bedford, MA 01730; (617) 275-4056; e-mail: <70421.1766@compuserve.com>

# 60

By my calculations, you should be reading these notes about reunion time. I hope that many of you will be able to attend some or all of the festivities, and I look forward

to seeing familiar faces and a few faces that probably have changed a bit. (Have any of us aged?—maybe just a bit?)

Let me start with one of my all-too-frequent "oops." **Robert Stengel** has not changed the spelling of his name, contrary to the way your secretary reported it in the April notes. Sorry, Rob. . . . **Peter Belmont** writes that he will not be able to attend the reunion as he will be studying for the bar exam. Pete's plans call for graduation from Brooklyn Law School in June, and he hopes to hang his shingle with a firm doing environmental work. Best wishes for success, counselor, and, for now, no lawyer jokes from these quarters. . . . From Phoenix, Ariz., comes word from **Bob Hodges** that he hopes to make it to the reunion. Bob says his work with Rogers Corp. keeps him too busy to have enough time for competitive tennis. He and Karen did, however, have time for a quick trip to Europe in January.

**Ron Agronin** says that he is being kept busy commuting between Stamford, Conn., and Maryland. The last of the Agronin children were married in October 1994, so Ron and his wife are now among the empty-nesters. By the time you read this, Ron hopes to be a grandfather for the second time. (Your secretary is still in the denial stage. My younger son and his wife have a son, but I'm still too young to be a grandfather. Anyone else have the same feeling/problem?) . . . **Kearny Hibbard** reports that after 26 years with Thomas and Betts, the last 22 as treasurer, he remained in Somerville, N.J., when the firm moved to Memphis, Tenn., in 1994. He is now the CFO for FAI Insurance Counselors in Florham Park, N.J. . . . In a note from San Francisco, **William Nicholson** reports that he has been promoted to director of energy and environmental services for the Potlatch Corp.

A news release includes **Alan Ardell**, UCLA's chairman of the Department of Materials Science and Engineering, among the contributors to a treatise, *Intermetallic Compounds—Principles and Practice*. The treatise is contained in two volumes, with 75 chapters and 1,900 pages. . . . In May/June 1993, I reported that **Kern Kenyon** was well on his way to providing a shorter, clearer derivation for Kepler's First Law—remember, each planet goes around the sun in an ellipse with the sun at one focus of the ellipse. In a recent phone conversation with Kern, he told me that he could derive all three of Kepler's laws starting with only one equation instead of two. Kern's proof has been published in *Physics Essays*, Volume 7, number 4, December 1994. Volume 6, number 4, of the same journal reported on Kern's earlier work. I refer interested readers to Kern's articles, lest I stretch myself too far—which I did many times in 8.01 and its equally excruciating follow-ons. Unfortunately, Kern said he would not be able to attend

# ClassNotes

our 35th get-together to personally explain his work.—**Frank A. Tapparo**, secretary and class agent, 15 S. Montague St., Arlington, VA 22204

# 61

## 35th Reunion

Please send news for this column to: **Andrew Braun**, secretary, 464 Heath St.,

Chestnut Hill, MA 02167; or via Internet: <andrewb820@aol.com> or <abraun@husc4.harvard.edu>

# 62

Received a nice note from **Steven J. Brams**, professor of politics at New York University. He enclosed a copy of an article about his collaborative work with **Alan D. Taylor**

from the March, 1995, issue of *Discover* magazine. Their book, *Fair Division: From Cake-Cutting to Dispute Resolution*, will be published simultaneously in paperback and hardcover by Cambridge University Press in the fall. The article begins: "Steven Brams keeps a low profile for the fairest man who ever lived. A political scientist at New York University in downtown Manhattan, he seethes with ideas for improving the world, schemes that unfold in a dozen books. Yet somehow the powers that be have managed to ignore him." Perhaps we need Steve to replace the "Washington Crowd" if we expect to get fairness back into the federal government. If you missed the article—send a copy to our friend "Newt" in D.C., he seems to need some help on "fairness" in government!

In case you missed it, the Sunday, March 26, *New York Times* had an interesting article on the return of "chain gangs" for prisoners in Alabama. As a resident of Birmingham for the academic year, it just warms my heart to see men shackled and forced to do hard labor for the purpose of putting fear into the hearts of would-be criminals. With such progressive attitudes, how much longer can we live without repeal of the 13th Amendment to the U. S. Constitution? Perhaps it can be attached as a rider on the next introduction of the Balanced Budget Amendment. Perhaps we need a few copies of Steve's book for distribution to our state government officials as well as those in our nation's capital.

Mary and I had a great time in Colorado in March. I had a chance to visit with classmate **Joan Gosink** and to discuss some of her innovative interdisciplinary programs in engineering and technology. Joan is head of the Engineering Division of the Colorado School of Mines in Golden. We reminisced about our undergraduate days and some of the MIT women students of our era. We would both like to hear more news about what they are doing and what they have accomplished since leaving Tech in 1962.

**Michael S. Feld** sent a long note about his activities at MIT. Mike works at MIT at the

Spectroscopy Laboratory, and he is co-chair of the Martin Luther King Committee. His committee has developed a new initiative for bringing under-represented minority scientists and engineers to MIT as Visiting Faculty. Mike says that the MIT Spec Lab is experiencing one of its greatest periods of achievement, with research spanning the range from a single atom laser to new advances in spectral diagnostic technologies for medical applications. Equally important, Mike is proud of his 11-year-old daughter, Alexandra, who successfully completed a recent performance in the Boston Ballet's *Nutcracker* as a candy cane! . . . I recently retrieved a misplaced note from Class President G. Mead Wyman who assures us that he will have an address on the Internet soon. Mead passed along a letter from MIT about classmate H. Richard Howland's winning the George B. Morgan Award from the MIT Alumni/ae Society last September. We already mentioned that award in the column several months ago, but it is important enough to mention again.

The MIT1962 e-mail system seems to be working. Jean-Pierre Frankenhuis has been contacting me from time to time from Paris, to discuss the appropriate content for messages sent to our classmates. Jean-Pierre was surprised that I remembered his editorials in *The Tech* from our days on the MIT paper. J-P was in charge of the entertainment page, and wrote interesting reviews as well. He still remembers an editorial on how running for class president was probably less interesting than trying out for the squash team. This has continued to stick with him since he is very

involved in Paris with the International Squash Federation, and still feels it is more interesting than running for class president! As always, J-P has something interesting to say, and does not shrink from the opportunity to say it! He attributes this to growing older and the natural crankiness of being unable to control things one could control even 10 to 15 years ago. I sometimes wonder whether that is the result of trends in technology or just the nature of the human condition. J-P also mentioned that he has the most beautiful, smartest, and funniest 13-year-old granddaughter in the world (but would never say so, of course).

Michael H. Kaericher sent me a recent e-mail missive, also concerning the distribution of materials on MIT1962 (input and comments always welcome). He seems quite happy about the establishment of the e-mail list as a good method of keeping in touch with our classmates. Mike has been shifted around at Ford during the years since his return from Brazil in 1990, but is still involved in corporate strategy. He is now with the Government Affairs and Corporate Economics Office and is concerned with "Strategic Issues" (the meaning of this concept seems to be very elusive and is subject to change). He is thankful that he is still employed by Ford after much restructuring, and is loved (by Ford and his wife of 29 years). Mike's oldest son (29) now has his merchant marine captain's license. Son #2 (27) has returned from two years with the Peace Corps in Nepal, is living in Duluth, Minn., and planning marriage later this year. Number 3 son (25) is teaching English in

Pusan, Korea. And his youngest son (23) is living at home and working in Ann Arbor, Mich.

If you can find a window to the Internet, please telecommunicate with: <mit1962@mitvma.mit.edu>. Alternatively, you can send a message directly to me at: <uabnm01@ascube.asc.edu>. If you still communicate by surface mail, please send your class news and personal notes to: Hank McCarl, secretary, P.O. Box 352, Birmingham, AL 35201-0352.

# 63

Please send news for this column to: Shael M. Cohen, secretary, Dept. of Psychology, Nassau Community College, Garden City, NY 11530; (516) 489-6465 (h); e-mail:

<71271.2627@compuserve.com>.

# 64

Came across some information on Frank des Sarkisian (Course VI). He is currently a freelance data programmer and writer in Needham. After graduation, Frank worked for

Raytheon until MS intruded and knocked him out of the usual workday world. He then joined a friend in starting a company to service small businesses that use computers. . . . Duncan "Duke" Miller (Course II) left BBN last year after more than 30 years, following BBN's sale of its Advanced Simulation Division to Loral. He is now leading a simulation group at Lincoln Labs working on the next generation of simulation. . . . David Slosberg

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started his own computer consulting company in Parks. He reports that while business isn't that good, Paris is, as always, *great!*

**Leo Cardillo** (Course VI) is still in Washington working for the CIA. He lives in Fairfax and says that he would love to have anybody from the class contact him when they are in the area. . . . **Dennis Deegan** (Course III) reports that he continues to enjoy consulting in metallurgical engineering. Forensic work has become his major focus in recent years with the increasing need for technical contributions to support accident investigations and other legal matters. Dennis and wife Madeline live in Easton, Pa.

Don't forget, we have a class mailbox <mit1964@mitvma> that can be used to exchange all sorts of information. Please use it.—**Bill Ribich**, secretary, 18 Revere St., Lexington, MA 02173; (617) 862-3617

## 65

A series of small reports this month. I appreciate the e-mail messages particularly. . . . **Neil Lupton** will celebrate his 50th birthday on August 8. Does this make him the youngest

member of our class, or are there others of you who still haven't turned the second half century yet? . . . **Rick Gander** reports that the Newton United Masters Soccer Club won the Over-40 Division III championship in the Over the Hill Soccer League. Rick plays mid-fielder. I thought soccer was limited to children and grandchildren—I didn't know anyone our age even knew how to play the game! . . . **George Kossuth** is still at Draper Labs after 30 years. As a principal member of their technical staff, he focuses on real time programming for embedded computer systems. Son Jonathon graduated from Course XVI in 1993 and daughter Mary Beth from Course III in 1994.

**Michael Huke** was recently appointed to the Southeastern Regional Advisory Board for FannieMae. He is president of CIH Companies, a real estate operator/developer focused in part on affordable housing. . . . My daughter Susan, Zack, and grandson Jayme are moving to Rapid City, S. Dak. Does anyone know where South Dakota is? Is this still Indian territory?—**George McKinney**, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167; (617) 232-4710; e-mail: <georgemck@aol.com>

## 66

### 30th Reunion

I have to admit I did actually receive one news item for this column through the

Alumni/ae Fund, but I filed it very carefully, probably in someone's tax return. I'm sure it will turn up, just a little late. That leaves me with just one other letter, but a long and news filled one at that.

**Margaret Shork Chatterton** and **Howard Chatterton** had a busy year. All three daughters received degrees; Jacquie and Chris earned master's degrees from MIT and Old Dominion respectively, and Kathy, a BS in civil engineering from Virginia Tech. Later in the year both Kathy and Jacquie were married, leaving Muff and Howard to enjoy their large new house alone. Howard taught his

first major fire-fighting class with only minor injuries to his students. Margaret completed both the Boston and Marine Corps marathons, finishing fifth in her age group in the latter.—**Eleanore Klepser**, secretary, 84 Northledge Dr., Snyder NY 14226; e-mail: <vismit66@ubvms.cc.buffalo.edu>

## 67

Most of the recent news from classmates has arrived via e-mail, which reflects the fast growth in this wonderful communication medium. You can find my address at the end of

this column. **John Patterson** reports that his relationship with MIT has expanded since he is now a member of the Educational Council and a parent. His son Ned just completed his freshman year at MIT, where he lives in the Beta house and is a member of both ROTC and the sailing team. "He's caused many memories to come flooding back during our trips to get him established and our phone calls and letters (by e-mail)." Because his son had to travel 90 miles for his MIT interview, John joined the Educational Council to help out in the rural area where they live (California, Md.). There are few MIT applicants there, but John has enjoyed meeting each of them and drumming up more visibility for MIT. Two years ago John left his job as the Navy's program manager for common avionics and became the vice-commander of the Naval Air Warfare Center Aircraft Division at Patuxent River, Md. They've been involved in the base closing process with two bases being closed from the '91 and '93 lists and two more proposed for '95. Their only remaining site, Patuxent River, is experiencing a building boom unmatched since its inception in World War II, with over a million square feet of new construction. "Trying to close two bases, decide on the other two, and build up the fifth intelligently while continuing to provide the increasing level of services our customers demand with ever decreasing personnel (due to downsizing) has been a major challenge. I've begun to think about life after the Navy since I must by law retire within the next three years, but I still don't know what I want to do when I grow up." John and Suzanne enjoy their life in Maryland. Their second child, Emily, will be a junior in high school. "She is thinking about becoming a medical doctor. . . scary!"

**Jim Small** reports by e-mail: "We have moved again, I hope for the last time. We have left the four seasons of California (drought, fire, flood, and earthquake) for clear desert skies and a better social environment to raise our children. Gloria and I are back in Tucson, where I was once a university professor. I am now a mid-level manager with Hughes Aircraft. The only publishing I get to do these days are patents. We started our family rather late but with a double blessing. The twins, David and Jonathan, are now 12 and in the 6th grade." . . . Also by e-mail, **Don Bellinger** writes that he has stayed pretty much in the MIS/strategic planning field, in the Washington, D.C., area since 1975. He's currently consulting to non-profit associations for internal systems and electronic publishing. He and Kathy have three daughters in high school. They joined **Audrey** and **Pete Denton** in Maine and conquered Mount Katadin last summer,

# ClassNotes

where they showed the children the mountain by following them as they charged across the peak. "It's tough to beat New England." . . . **Gerald Siegel** spent 10 years as a management consultant with KPMG Peat Marwick in New Jersey, most recently as a partner in the government systems practice. In January 1993 he joined Gemini Consulting, Inc., as a principal, specializing in "information technology enablement for business transformation (aka reengineering)." His wife, Kathy, just started a second career as a recruiter in a small executive search firm in Princeton. Their son Josh will be a sophomore at Brown, and Jon will be a senior at Princeton Day School. . . . **Lou Offen** passed the Maryland Bar in 1994.—**Charlotte** and **Jim Swanson**, co-secretaries, 878 Hoffman Terr., Los Altos, CA 94024; e-mail: <jswanson@lat.com>

## 68

Greetings again from the banks of the Potomac. We both are members of the MIT Educational Council which means we interview high school seniors applying to

MIT. Yesterday, we received the list of admitted students for next fall and as usual we called them to express our congratulations. Until now, all the students we had ever called had already heard directly from MIT, but yesterday Mike reached one whose letter had been delayed and was able to be the first to tell him! It is good to see the process of an MIT education starting from the beginning.

The mailbag is unusual this month because we have three notes from academics—two of which have a common note. **Mike Krashinsky** is "still" a professor of economics at the University of Toronto. He survived—"barely!"—a year of administration as acting chair of his division and is now back doing what he loves best—teaching and research. His oldest son is in his third year at Queen's University and his second son goes next year. . . . On a similar note, **Steve Kanter** writes that he has stepped down as dean after eight years at the Northwestern School of Law of Lewis and Clark College in Portland, Ore., "returning happily to the faculty." In 1993-94 he was on sabbatical as Fulbright Professor of Law at the University of Athens in Greece. He also returned to Kazakhstan where he had helped write the new constitution in 1992.

**Carson Strong** is professor, Department of Human Values and Ethics, University of Tennessee College of Medicine. He and his wife, Peggy, live in Memphis and have two daughters, Ardis, 11, and Tara, 9. . . . From Lafayette, Calif., we hear that **Kathleen** and **Bill Charles** have discovered windsurfing and spent their 10th anniversary trying to look competent on Maui. Bill is "still" trading stocks, options, and futures for his partnership. Their son, Ian, is having great fun learning to read and compute. . . . **Bob Dixon** has left Crucible Corp. of Syracuse, N.Y., after 19 years, most recently working as technical director, Service Center Division. He has joined **Abar Ipsen** in Bensalem, Pa., as market-

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ing manager—tool and die. The firm is a leading manufacturer of industrial vacuum and atmosphere furnace equipment.

We were saddened to hear from Peter Jax that his wife, Vicki Ann, 47, a resident of Seal Beach, Calif., for more than 20 years, died February 9 after a courageous and inspiring three-year fight against ovarian cancer. In addition to her volunteer service to her community and church, Vicki Jax was also a nationally recognized lecturer, educator, researcher, and therapist in speech and language pathology. Having earned a PhD in special education from UCLA in 1988, she focused her efforts on serving infants and preschool children with special education needs. She was the director of speech and language services at Providence Speech and Hearing Center in Orange, Calif., where she and her staff helped families with deaf and language disabled children learn to communicate. She taught graduate and undergraduate courses at USC, Mt. St. Mary's College, Whitier College, CSULA, and CSULB, the institution from which she earned a master's in communicative disorders in 1973. Her service and outstanding contribution to the advancement of her profession was recognized last year when the California Speech-Language-Hearing Association (CSHA) bestowed its highest award, the prestigious Honors of the Association. She and Peter have two sons Robert, 18, and Christopher (CJ), 16. Our sincere condolences to Peter and his family.

That's all we have this month. Show us you are computer literate, send us something by e-mail!—Gail and Mike Marcus, secretaries, 8026 Cypress Grove Ln., Cabin John, MD 20818; e-mail: <ghm@nrc.gov> and <mmarcus@fcc.gov>

# 69

Please send news for this column to: Eugene F. Mallove, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304; e-mail: <76570.2270@compuserve.com>

# 70

Jim Pelegano tells us (via e-mail) that he is on the faculty of Columbia University Medical School working at the Columbia University Medical Center, while his wife is working in the Department of Cardiology at St. Luke's-Roosevelt Hospital in Manhattan. Their daughter has finished her sophomore year at Columbia, one son graduated from high school, and the other will be a senior. Jim is also pursuing his interest in the theater by taking acting classes in Greenwich Village.

Jim Leary is head of the Molecular Cytometry Unit in the Infectious Diseases Division of the Department of Internal Medicine at the University of Texas Medical Branch in Galveston, where he is a tenured professor. He has two grown stepchildren, and his daughter, Selena, is graduating from Cornell and his son, Michael, is entering seventh grade.

Paula Fines remarks how this is a year of milestones: It is our 25th class reunion; it is her 25th wedding anniversary and her 25th year at AT&T; and her daughter is off to college. At AT&T, Paula is a technical manager responsible for AT&T's light wave transmis-

sion products sold to Japan. Her responsibilities range from product development to manufacturing planning to field support.—Greg and Karen Arenson, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023

# 71

## 25th Reunion

Peter Stoll writes: "With a DAT recorder and editing on my PC, I am suddenly playing amateur recording engineer for several Albuquerque musical events. The high point was recording the Christmas concert at St. John's Cathedral." . . . Al Solish writes: "We would like to hear from any of our old MIT friends. We live in La Canada, Calif. Peg (Margaret Frerking, '72) is still at JPL. I'm still practicing medicine (though the handwriting is on the wall), Ben (12) is still skiing, Daniel (9) is playing basketball, and Barbara (5) is just starting kindergarten."

Please don't forget to save your money for our 25th Reunion in the summer of 1996. We are planning a great program and hope everyone will come.—R. Hal Moorman, secretary, P.O. Box 1808, Brenham, TX 77834-1808

# 72

Please send news for this column to: Co-secretaries: Wendy Elaine Erb, 6001 Pelican Bay Blvd. #1001, Naples, FL 33963; Dick Fletcher, 135 West St., Braintree, MA 02184

# 73

Jean and Irv Paskowitz are the proud parents of an MIT undergrad: middle son Michael, '99, started at the 'Tute this past fall. Older brother Daniel is at the "less fashionable end of Mass. Ave." . . . Tom Wheeler is an associate professor of biochemistry at the University of Louisville, 14 years there now. His research deals with various aspects of the kinetics of glucose transport in animal cells. For 1993-94, he was on sabbatical at R.W. Johnson Medical School in New Jersey. Recent years have found him active in public science education and offering a course for medical students exploring claims of "alternative medicine." He and wife Valerie have two soccer-playing sons, Jay and Eric. Tom, like yours truly, keeps in shape long-distance running. . . . Philip Sadler continues work at Harvard's Smithsonian Center for Astrophysics, developing remote telescopes that are Internet-accessible for children.

Mike Knauer has spent over 21 years with Digital and still is going strong. He travels extensively as an IS operations consultant. Wife Kathy is the administrative secretary at Burlington's Parks and Recreation Department. Daughter Kate is a sophomore art major at Iowa; son Tom is a high school junior and another soccer-player; and daughter Carrie has traveled to Belgium with her skating team. . . . Richard Robison finished a PhD in applied linguistics at UCLA; his 10th child (girl #6) was born in January. He is currently an associate professor at Azusa Pacific University. . . . Lieutenant Colonel Tom Johnson is still in the Air Force, stationed at Kirtland AFB, N.M. He is at the Phillips Lab there, the Air Force's pre-

mier laboratory for space technology, but plans to retire this summer.

My e-mail has changed (check new address below)! I am now celebrating five years with PRC, my second on the Super-Minicomputer Program. All is relatively unchanged at home, except that Eric (Radford now '98) has just been readmitted to college after a year-and-a-half hiatus and will complete his studies. Hooray!

Write or e-mail!—**Robert M. O. Sutton, Sr.**, secretary, "Chapel Hill," 7721 Churchill Ct., Marshall, VA 22115; e-mail: <sutton@smp.pcmail.prc.com>

# 74

Fellow classmates, it is a small world. I opened up the envelope with updated information on a few of you (way too few, I might add) and what do I discover? Two of us have lived

in the same small Wisconsin town for a year now without realizing it! **Robert Gahl** writes that he is the president of the Rotary Club of Two Rivers, Wisc., (look at the end of the column to see where I live), where he is also president of the medical staff of Two Rivers Community Hospital (where my dietitian wife works) and a member of the board of directors of the hospital. He adds that his 13-year-old twin sons Dave and Tom are anxious to apply for the MIT Class of '04 and live in room 405 at Bexley Hall (wonder why they selected that particular room?). Daughter Julie, Class of '05, is holding out for more concessions before committing to the Institute. Are the two of us enough to start up an MIT club?

**Andre Jaglom** celebrated the 10th anniversary of Stecher, Jaglom & Prutzman, where he is still practicing distribution and marketing law in Bronxville, N.Y. He is doing more computer law, especially software protection, and also lectures on the subject. He takes great joy in his kids, Peter, 11, and Wendy, 7.

Finally, **William Young** retired from the Air Force in February, going out as a major. He can't believe it has been 20 years already, because he's right back where we all were in 1974, looking for work!

Please do write. Even with two of us here in Two Rivers, we do like to hear of what's happening out there in civilization!—**David Withee**, co-secretary, 3702 Adams St., Two Rivers, WI 54241-1404

# 75

Apologies for missing our last column. Here is the news: **Peter Mancuso** recently completed a term as president of his local Chamber of Commerce. He has returned to his

position as an assistant district attorney in the Special Investigations Bureau in the Office of the Nassau County (NY) D.A. . . . More fellow lawyer info: **Robert C. Laurenson** recently rejoined Lyon & Lyon, an intellectual property firm based in Los Angeles, after serving two years as a clerk to the Honorable S. Jay Plager of the U.S. Court of Appeals for the Federal Circuit in Washington, D.C. He is now resident in Lyon & Lyon's La Jolla office, and is actively developing an electronics, computer software, and multimedia-oriented practice.

**Michael Lebowitz** writes, "My wife, Betsey Malcolm, and I have two beautiful boys, Chris (4 1/2) and Brian (3). I'm a principal in fixed

income research at Morgan Stanley. Family life and the financial world make for a busy life." . . . **Joseph A. Martore** is president of Management Strategies, Inc., a management and engineering consulting firm providing policy and programmatic support to the Department of Energy and Fortune 500 companies.

. . . **George Gerpheide** is "keeping busy growing Cirque Corporation, the inventor and promoter of GlidePoint® track pad computer pointing device products, here in Salt Lake City, with the support of my wonderful wife, K.C. and children, ages 4 and 6."

**Leonard J. Weiss, M.D.** provided a chronology of his medical career. He became board certified by (1) the American Board of Internal Medicine in 1982; (2) the American Board of Nutrition in 1984; and (3) the American Board of Psychiatry & Neurology (in Psychiatry) in 1993. He's been in private practice in psychiatry in Chicago and the North Shore area since 1991. Finally, as first author, he published "Psychosocial Aspects of the Geropsychiatric Patient," in the *International Journal of Geropsychiatry* (1994).

**Joseph Sacco** writes, "Life goes on in Albany at an increasingly hectic pace, partly as a consequence of flourishing clinical research and the untimely death of my associate at the VA. I've accumulated two new titles, but no more salary. . . ah, well. I continue to be active on the local CME lecture circuit which is a very enjoyable change of pace. The family is well. Gail has been doing her usual great job running her library and just received her second grant from the National Endowment for the Humanities. Daniel and Claire grow like the proverbial weeds; he wants to take racing lessons on the slopes this year, while I'm just getting ready for the challenge of skiing the novice trails. Last winter's unfortunate experiment in momentum and inertial forces resulted in a rather spectacular wrist fracture, thankfully healed. Greetings to all."

**John W. Kennedy** had this to say, "For the past eight years I have worked at MRS Technology Inc., in Chelmsford, Mass. MRS manufactures photolithography equipment used in the production of flat panel displays. I was a member of the initial software design team, then moved on to management roles. On April 4, 1992, Donna J. Currie and I were married. In June of 1993, we moved into our new home in Littleton, Mass." . . . **F. Carl Mueller, MD**, is alive and well in practice in Stamford, Conn. He "finished" the second anniversary with his second wife ("finally got this marriage process debugged"). He says that he would enjoy hearing from folks, especially "old Sig Eps". . . . Daughter No. 2 was born in April 1994, reports proud father **Joseph L. Jones**. Emily joins her sister Kate, now 4 years old.

**Pat Callahan** is still living in Marin County, north of San Francisco. She is personnel director for Wells Fargo Bank after spending 15 years in systems and operations. Her children, Katherine and Kevin, are now 9 and 5 years old, respectively.

Finally, I received the following letter from **Robert Graber**: "After working at a variety of jobs in the area of financial analysis, I recently returned to graduate school full time. I entered the PhD program in International Financial Economics at the University of New Orleans in August of 1993. I'll be "all but dissertation" in May. My dissertation deals with the inter-relationships among job longevity of

# ClassNotes

managers, long-term planning by corporations (in research and development, employee training, marketing, etc.), national productivity, and the balance of payments. I'm attempting to combine the theories and empirical evidence in international economics, corporate finance, and management. Luckily, I have people from all three disciplines who have agreed to be on my dissertation committee. I'm also working for the University of New Orleans as a teaching assistant, in business statistics. What scant free time I have is spent working out (Nautilus), jogging, hiking, and bicycling. (Perhaps I'm in denial about being in my forties). I'm enjoying the academic lifestyle, even though I'm working harder and making much less money than when I worked at conventional finance jobs." Bob indicated that he would like to hear from other classmates. His address and phone number are: 500 Lake Marina Dr., New Orleans, LA 70124; (504) 283-2312.

That's all for now.—**Jennifer Gordon**, secretary, c/o Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036 or 18 Montgomery Pl., Brooklyn, NY 11215

# 76

## 20th Reunion

A pleasant result of our having an e-mail setup is that we are now hearing from classmates

who have been out of touch, in some cases since graduation. They are sending e-mail, as it is more convenient than the still conventional postal mail. As your secretary, I wish to urge all of you to write. We always need news; with e-mail, it is easier than ever before to keep in touch, and pass us a little news of your doings.

After 18-plus years, we have finally heard from **Steve Isaacs**. "I'm sitting here reading **Bob Steininger's** *Tech Review* and thought I should finally reveal my whereabouts. For the past five years I have been senior researcher in charge of a research project involving control of activated sludge wastewater treatment processes at the Technical University of Denmark (Dept. of Chem. Eng., Bldg. 229, DTU, DK-2800 Lyngby, Denmark, +45 45 88 32 88). I spent the five years previous to this getting a PhD in Hannover, Germany. Yes, I am fluent in both German and Danish now. Weirdly enough, I am also one of the two 'Danish' representatives in an EU-funded management committee organizing and planning where research in this field should be performed. If project funding continues, I will most likely continue being an expatriot in the future, so all former acquaintances from MIT are welcome to stop in if they come to Denmark. More info on me will follow with unspecified regularity." . . . From **Arne Langsetmo**: "Seeing as the vaunted Internet has made it so much easier to send mail, I am taking this opportunity to send my first-ever missive to the *Tech Review* Classnotes. Been doing various things in the interim since 1976. First, grad school in neurophysiology (four papers, but only degree an A.B.D.), then on to a high-paying (at least at the time)

# Puzzle

Continued from Page MIT 54

major and East would be squeezed again.

On any other opening lead East wins eight major suit tricks and two diamonds, but either puts dummy in with a diamond or leads into South's club tenace.

East cannot do no other hand. If she held three aces, there would be no possibility of a squeeze (for 13 tricks). If she held but one ace, she wouldn't have 30 points. Missing two aces, the only combinations in the aceless suits to provide 10 points are KQ, KQ; KQJ, KJ. KQ, KQ would prevent running a long suit.

A two-suit squeeze against AKQJ, AKQJ would be impossible with two losers. Therefore, a three-suit squeeze is required. Since not all the threat cards can lie in one hand, one or more must lie in dummy. For dummy to be reachable, it must contain one of the aces: in this situation, the side-suit ace. Since West must be denied any control cards for the squeeze to be effective, the rest of the layout falls into place.

**F/M 2.** Victor Baracas has a bunch of regular n-gons (prizes from winning the gon show?) and asks, "If a regular n-gon has area A and perimeter P, express the ratio  $P^2/4A$  as a function and find the limit as n approaches infinity.

Ed Kaplan notes that a regular n-gon is comprised of n isosceles triangles arranged pizza style! Place the n-gon such that it is sitting on one of these triangles; the interior angle at the top of the isosceles triangle equals  $2\pi/n$ . Let the length of the isosceles side(s) equal r. Then the base of the triangle will equal  $2r \sin(\pi/n)$  while the area of the triangle will equal

$$r^2 \sin(\pi/n) \cos(\pi/n)$$

(for the height of the triangle is  $\cos(\pi/n)$ ), and hence the perimeter of the n-gon is given by

$$P = 2rn \sin(\pi/n)$$

while the area of the n-gon is given by

$$A = nr^2 \sin(\pi/n) \cos(\pi/n)$$

Letting f(n) denote the ratio  $P^2/(4A)$  in the problem, we have

$$f(n) = (2rn \sin(\pi/n))^2 / (4nr^2 \sin(\pi/n) \cos(\pi/n)) \\ = n \sin(\pi/n) / \cos(\pi/n) = n \tan(\pi/n)$$

As  $n \rightarrow \infty$ ,  $\cos(\pi/n) \rightarrow 1$  while  $n \sin(\pi/n) \rightarrow \pi$  (using L'Hopital's rule), so we see that  $f(n) \rightarrow \pi$  as  $n \rightarrow \infty$ .

As a check, we know that as  $n \rightarrow \infty$ , the n-gon becomes a circle. For a circle with radius r, we have  $P = 2\pi r$  and  $A = \pi r^2$  and as a consequence

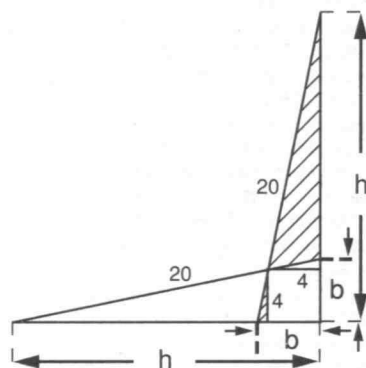
$$f(\infty) = (2\pi r)^2 / (4\pi r^2) = \pi$$

verifying our earlier approach.

**F/M 3.** George Blondin wonders how high on the wall does a 20-foot ladder reach when

it rests against the edge of a 4-foot cube?

Beautiful solutions were received from Henri Hodara and John Kennedy. Hodara's is reprinted below. John Prussing objects to the problem because he found it while cleaning up the living room and now has solved the problem, but not cleaned the room!



The two possible solutions are shown in the figure above. Pythagoras gives:

$$(1) h^2 + b^2 = 400$$

Since the two shaded triangles in the figure are similar,

$$(2a) (h-4)/4 = 4/(b-4), \text{ or}$$

$$(2b) hb = 4(b+h)$$

Squaring (2b) and combining with (1) yields a quadratic in (hb),

$$(3) (hb)^2 - 32(hb) - 6400 = 0$$

whose solution is

$$(4) hb = 97.58$$

Multiplying now both sides of (1) by  $h^2$  yields a quadratic in  $h^2$ :

$$(5) h^4 - 400h^2 + (97.58)^2 = 0$$

The two solutions of (5) are:

$$h = 19.35, h = 5.04$$

and the corresponding values of b follow from (2a) are:

$$b = 5.04, b = 19.35$$

## Other Responders

Responses have also been received from T. Blatt, F. Carbin, D. Church, D. DeLeeuw, S. Feldman, M. Fountain, S. Gaither, M. Garrison, T. Harriman, D. Harris, W. Hartford, K. Haruta, P. Herkart, R. Hess, A. Hirshberg, R. Hoffman, R. Holt, E. Kaplan, P. Kramer, P. Lally, H. Lieberman, M. Lindenberg, L. Nissim, A. Ornstein, A. Palmer, J. Pickel, K. Rosato, E. Sard, D. Savage, L. Schaider, A. Shagen, D. Simen, R. Sinclair, N. Spencer, L. Steffens, H. Stern, A. Ucko, D. Waggoner, T. Weiss, R. Whitman, A. Wiegner, C. Willy, and J. Woodman.

## Proposer's Solution to Speed Problem

They need to know how to log a rhythm.

Another 14 months or so and I'll be loose on an unsuspecting planet. Woe be to any Republicans or other subverters of the Constitution. I see Debbie Lerman occasionally, and saw Fort Felker out here in 1991 or so."

From Bill May: "I have been reading your section in *Tech Review* for years (and noticed several classmates along the way), but never contributed. Maybe it is about time! First, I would like to say hello to fellow Bexleyites. There was a reunion a couple (few?) of years ago I would have liked to attend. I have been married for eight years now, and have a 5-year-old son. We live in San Jose, Calif. (although we would like to move back to the Boston area some day, closer to family and friends). I work at a startup company, Minerva Systems, as principal software engineer. We are developing high-quality MPEG video and audio encoders for the (hopefully) coming digital video revolution. Not an easy task! Nevertheless, Minerva has gone from 6 to 40 employees in the past several months, and things seem to be progressing quite well."

Alan Dubin sends e-mail: "In 1983 I started working for the Engineering Materials sector of Allied Signal, based in Morristown, N.J. My group is called Modulus, referring to the design engineering and technical support service provided to customers of our thermoplastic resins, Capron nylon, and Petra polyester. In February 1993, I accepted an overseas assignment to work in our European headquarters in Haasrode, Belgium (near Louvain), to be responsible for our customers in Europe and the Middle East. With wife Mary Anne and daughter Lisette, who was 8 months old at the time, we packed up our house and became expatriates. Since then we had a son, Justin, born over here in July 1993, coincidentally a mere 20 minutes after the death of Belgium's former King Baudouin. Notwithstanding, he is still considered a U.S. citizen by the authorities. Living and working in Europe these last two years has been an experience, to say the least, quite different from our past lives in the United States—at certain times quite challenging, and at other times frustrating. Belgium is probably one of the more easy countries to assimilate into, since like much of western Europe, it has been highly 'Americanized.' They have three official languages: Flemish, French, and German, and it helps to speak at least one of them fluently. We started out by studying French and ended up living in a Flemish town, Overijse, with little regret. Nearly everyone educated since the 1950s understands at least some English, so it isn't that hard to get by. Among the more challenging aspects of life here at first involved setting up house with two small infants, finding all the right baby products, especially pediatric care up to U.S. standards (still somewhat of a compromise), and dealing with the local bureaucracy. After battling against Belgian drivers, I'll never again criticize Boston. Once we had settled in and began meeting people, things became easier. Our one major regret is that, while I've been to some exciting places on business, it's been difficult to travel extensively through Europe as a family with the kids still so young. We're hoping this will improve in '95, after which it will be time to repatriate and experience the culture shock anew."

We also have news through the postal mail. Jeslie Chermak writes: "Finally made use of my frequent flyer miles (collected over 10-plus years) and my accumulated vacation time for a trip to Australia. Went diving in the Coral Sea from a sailboat and the Great Barrier Reef, plus some cold-water diving in Tasmania that

job in computer programming, five years an independent consultant, and finally, in 1993, I decided to get a real job and enrolled in law school. Been out here in Berkeley since then at Boalt Hall School of Law at UC/Berkeley.

reminded me of my original certification dives at MIT. It was great!" . . . **Paul Erb** is "hanging on against all odds in the oil business... After two years of layoffs, they nailed my boss and his boss, combined the jobs, and gave it to me! Guess who's next?! Hope the severance package is good; I'm thinking of retraining as a charter captain. Here's to cold winters and higher (natural) gas prices!" . . . We have a lengthy letter which unfortunately is too long to quote directly from **Dan Christman**. After 14 years, he was laid off from Rohm and Haas. However, at the time of his letter he had one offer in hand, and was awaiting others. In addition to news on the job front, they have a new child since he last wrote—another son—**Benjamin Josiah**.

Your secretary has one other news item to report. I had the pleasure of being visited by **Eric Zweigel** after not seeing my former lab partner (5.32) for 18 years! Eric was in town on vacation to help his parents move; he grew up in Oceanside, a town very close to Woodmere. Eric went to the Harvard Business School after working for a couple of years upon graduation; after business school, he worked in several high-tech startups in the greater Boston area. Nine years ago, he went to Sun Microsystems, where he has been since. He is now a regional sales manager covering the entire Southwestern United States. Eric and your secretary had a fun time reminiscing and discussing classmates. Please write, using the medium of your choice. Or visit. We always need news.—**Arthur J. Carp**, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523; tel.: (516) 295-3632, fax: (516) 295-3230, e-mail: <quantalyt@aol.com>

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Please send news for this column to: **Ninamarie Maragioglio**, secretary, 9727 Stipp St., Burke, VA 22015

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More news from Alumni/ae Fund Donors: **Josie Stein** and husband **Richard Davies**, SM '84, "are delighted to have become parents of **Graham Douglas Stein Davies** born

November 10, 1994. He is strong and healthy, and already takes an interest in mechanisms (at least mobiles)." **Josie** and family are living in London, England. . . . **Alan Marcum** brings us up to date from the West Coast: "I've been at Next for over six years now and enjoying it more than ever. On the home front, we're expecting our second child in mid-March, to join our 4-year-old son, **Joshua**. I'm also heavily involved in a new Jewish reconstructionist congregation." Alan's e-mail address is <amm@next.com>. . . . **Mimi Montgomery** is now **Mimi Debicki**. She writes, "After 17 years in the field of marketing and marketing research with **Dun & Bradstreet** companies, I am taking a time-out to be with my new husband, three kids, and 'one on the way' this May. Coupon clipping here I come!"

**Larry Yablong** sends news from Chicago: "This summer our home became a lot more lively with the arrival of **Akiva Tzvi**, our newborn baby boy. Also my 5-year-old daughter, **Michal**, appreciates my company more now

that **Akiva** takes up so much of mom's attention. Being a dad is a great job, but sometimes it's nice to take a break and do some real estate deals now and then. This Thanksgiving I met **Albert Zisook** at our 20th high school reunion. He's got a few kids of his own. Al is back in Chicago but has left the ivory tower of theoretical physics for the financial world of derivatives at **Swiss Bank**." . . . **Arthur Wendel** returned to Middlesex County, Mass., in April 1994: "I'll probably be moving back to the D.C. area in May or June. I will be retiring from the Air Force after 16 years, and will be looking for a 'real' job. I'm a Course VIII graduate with extra education and experience in nuclear weapons." Arthur's e-mail address is <wendel@plh.af.mil>.

Finally, your class secretary's wife, **Diane Curtis**, and children—**Danielle** (4), **Luke** (3), and **Hannah** (1)—are doing great. **Diane** has gotten a real estate broker's license and opened **Curtis Real Estate** in Granville, Ohio, east of Columbus. She's got more business than even she can handle, so I have also gotten my real estate sales license in order to lend a hand when not writing software. All of this combined with the kids makes for a full and interesting life!—**Jim Bidigare**, secretary, 9095 North St. Rd. NW, Newark, OH 43055-9538; tel: (614) 745-2676, fax: (614) 745-5648

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**Steve Feldman** recently left **Phoenix Technologies** and "has gone to work in the Information Technology Department of a large Boston-based management consulting

firm whose pioneering teachings in the field have found their way into every MBA-level textbook on corporate strategy. It's my first employer of the last four where the founder didn't have ties to MIT. I am heading up the IT side of a project in which we are replacing all of our antiquated time collection and accounting systems with brand-new systems utilizing client/server technology in a worldwide distributed database environment." Steve's wife, **Debbie**, has taken an indefinite leave of absence from **Stratus Computer** to spend more time at home with their son and daughter. . . . **Bonnie Mason** and her husband, **Al Chock**, '78, had a second son, **Lee William Chock**, on January 3. She describes him as "the most darling, talented, and intelligent baby who ever threw up on his mommy's shoulder!" **Bonnie** works at **Wang** and was planning on returning there at the conclusion of her maternity leave. **Al** works in downtown Boston as computer systems manager for **Altran**. Big brother **Alfred** is five years old and "will undoubtedly be MIT Class of '08. He is an avid **Trekkie** and loves spaceships, robots, and construction toys. He wants to be a toymaker when he grows up!" **Bonnie** and family live in **Newton, N.H.**, and she requests that if anyone knows of a job opening for a software project manager in southern New Hampshire, please let her know (you can write to her through me). Along with the birth announcement, she enclosed a picture taken during our reunion last June of class members at the MIT Museum admiring the fake police car that hackers had somehow managed to get on the roof of Building 7 last year. . . . **Roger Lacy** apparently watched *My Three Sons* during his formative years, as he is the father of three boys, ages 1, 3, and 5.

# ClassNotes

Lots of promotions this month. **Sharon Plon** has received the Junior Faculty Research Award from the American Cancer Society. Sharon is an assistant professor of pediatrics and molecular genetics at Baylor College of Medicine in Houston. Her research focuses on cancer, genetics, and identification of genes involved in tumor formation and those that control cell division. Sharon got an MD and PhD from Harvard. . . . **Alan Smith** has been promoted from associate to principal in the intellectual property law firm of **Fish & Richardson**. He practices high technology patent litigation with emphasis in the electrical and telecommunications fields. His law degree is from the University of Southern California. . . . **Ken Keverian** has been elected VP of the Boston Consulting Group. Ken works in the Boston office in the high technology and health care practices. Prior to joining BCG six years ago, Ken spent seven years at **AT&T Bell Laboratories**. He has an MBA from Harvard.—**Sharon Lowenheim**, secretary, 98-30 67 Ave., Apt. 6E, Forest Hills, NY 11374

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Since I missed the May/June issue of classnotes, I have lots of news this month. **Birth Announcements: Micheal Greenwald** and his wife, **Ronna Bach**, were expecting their

second child last December; their daughter, **Alona Rivka Bach**, turned 2 in April. **Michael** is back in school pursuing a PhD in computer science at Stanford. . . . **Chau Minh Trieu Tran** was born October 18, 1994, to **Long Tran** and his wife. The translation of her name is "a million brilliant precious stones." On November 18, she celebrated her one month birthday, a Vietnamese tradition. . . . At the end of July, **Michael Monaco** and his wife, **Nadine**, will be celebrating the first birthday of **Daniel Robert**, their first child. **Michael** is still working for **MITRE** and is still enjoying it. He was selected for promotion to commander in the U.S. Naval Reserve.

**Job News: Paul Heckbert** is now an assistant professor of computer science, teaching computer graphics at **Carnegie Mellon University** in Pittsburgh, Pa. He and his wife have a 2-year-old son, **Julian**. . . . You can reach **Craig Finseth** at his new e-mail address: <fin@winternet.com>. He just started a new job doing IBM PC client/server development with **BlueLine Software**, a Minneapolis-based software company. **Craig's** wife, **Ann**, and kids, **Kari** and **Kyle**, continue to do fine. . . . **Kathleen Leitermann** is working at **Genetics Institute** in Andover, Mass. **Kathleen**, her husband, **Rich**, their two kids, and a dog live in an Andover neighborhood tucked into the **Harold Parker State Forest**. She would be happy to hear from old friends.

Hope the news is good for **Doug Walker**. Last news from him was that he was up for full professor at the University of Kansas, where he has been since 1985. . . . **Timothy Folster II** is still working for **H.E. Sargent, Inc.**, a general contractor located in Stillwater, Maine. His company specializes in remedia-

tion work and has diversified geographically to Maryland, Ohio, and New York.

**Other News:** Pamela (Stameris) Casey has recently relocated back to the Boston area. Pamela and her husband of ten years, Bill, reside with their two children, Tyler (5) and Jameson (2) in Boxford. . . . Down in Houston, Paul Homsy should be celebrating the receipt of a master's degree in public health. . . . I had to read it in the Penn State College of Science alumni/ae magazine: Paul Weiss, assistant professor of chemistry, and Stephan Stranick, a doctoral student, were recognized by the B.F. Goodrich Collegiate Inventors Program for their development of a tunable alternating current scanning tunneling microscope (ACSTM). They expanded the STM's capabilities to materials that don't conduct electricity.

**Class of '80 Scholarship:** This year's recipients have been selected. Esther Kim, a junior majoring in chemistry, was born in Korea, but is now a U.S. citizen living in Enterprise, Ala. Last summer she worked on a UROP project with Professor Robert Field. She plans to obtain a PhD and pursue a career in chemistry research. The other recipient is Erik Seidel, a sophomore from Lisle, Ill. He is majoring in mechanical engineering and plans to pursue a career in business or industry. Erik is a member of Sigma Alpha Epsilon fraternity, played freshman football, and worked part-time in the Alumni/ae Association office. Our contributions to the Class of '80 Scholarship fund make these awards possible.

Send your news to: Kim Zaugg, secretary, 549 Fairfield Rd., Canton, MI 48188; (313) 981-1785; e-mail: <vayda@erim.org>.

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Please send news for this column to: Mike Gerardi, secretary, 3372 Olive St., Huntington Park, CA 90255; (213) 587-2929 (h), (310) 553-5050 (w)

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More baby news: Peter Rogers and his wife, Rose, had a baby boy, Todd Adam Rogers, on January 10, 1995. He weighed in at 8 pounds, 5 ounces and was 22 inches long. He is doing great! Congratulations! . . . Wayne Seltzer's son, Michael, was born September 15, 1994. . . . David Shapiro moved back to Boston in October to take a job at the Harvard School of Public Health. He is a research associate in the Statistical and Data Analysis Center of the Pediatric AIDS Clinical Trials Group, working on studies of prenatal transmission of AIDS from mother to infant.

Thanks for the letters and e-mail.—Helen (Fray) Fanucci, secretary, 502 Valley Forge Way, Campbell, CA 95008; e-mail: <fangroup@aol.com>

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Susanne Von Rosenberg writes that she just started her own environmental consulting business called Gaia Consulting. Susanne named the company after the Gaia hypothesis

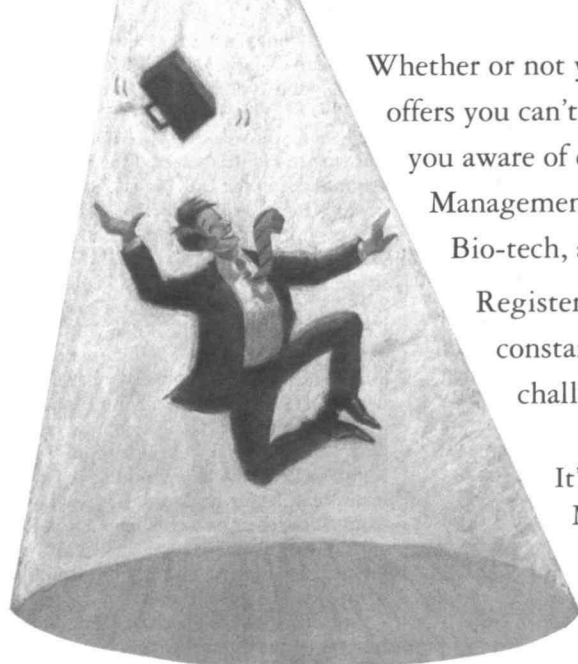
and the Greek Goddess of the Earth. Susanne says her new business is really intense and fun. . . . Gardell Gefke writes that he completed a master's in aerospace engineering in December 1994 at the University of Maryland and has entered the PhD program at Maryland, also in aerospace engineering. You can reach him at, <gardell@ssl.umd.edu>. . . . Steve Kim writes that he is completing a surgical residency at Barnes Hospital in St. Louis. Steve will soon begin a fellowship in surgical oncology at Memorial Sloane Kettering Cancer Center in New York City.

Steven DeFalco and his wife, Rosemarie, just bought a new house in Bedford Corners, N.Y. It has plenty of room for their three kids—Tommy, Stephen, and Andrew. Steve is a senior engagement manager for McKinsey in New York. Presumably, anybody planning a wedding should give Steve a call. . . . Since nobody else wrote in this month, here is some random information from our class listing: Stewart Canton is a senior consultant with Arthur D. Little in Cambridge, Mass. . . . Laurel Carney is assistant professor of biomedical engineering at Boston University. . . . Mark Childs is a member of the technical staff at GTE Government Systems in Needham Heights, Mass.

Joseph Drake is a process engineer at IC Sensors in Millpitas, Calif. . . . Joseph Iano is a partner at Flavin Architects in Boston. . . . John Montrym is principal engineer at Silicon Graphics in Mountain View, Calif. . . . Sharon Swede is a materials engineer at General Electric in Schenectady, N.Y. . . . Laurence White is at Comsat Labs in Clarkesburg, Md.

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Please keep those cards and letters coming.—**Jonathan M. Goldstein**, secretary, c/o TA Associates, High Street Tower, 125 High St., Suite 2500, Boston, MA 02110; fax: (617) 574-6728

# 84

Spring is here, but you wouldn't know it from the rain that just keeps on coming. Those Energizer folks must be diversifying. We're now up to 40 inches (annual

average: 15). By now it should be pretty obvious that the Class of 1984 did not have an 11th reunion. I think some of us are still woozy from the most excellent time we had last year at our 10th! Or maybe it's that these columns are having such a great effect at building a tight-knit virtual community that we no longer need to come together in real life?? (OK, probably not.) Well, one full year and no impeachments in our class yet, so I take that as a sign of full confidence!!

Now on to the updates: **David Horne** is an attorney at Hill & Barlow in Boston. His concentration is in corporate and securities law. . . **Jim MacStravic** writes, "I recently finished the program manager's course at Defense Systems Management College, Fort Belvoir, and am wending my way down to the Fleet Maintenance Office, Atlantic, for a tour under Rear Admiral Clark. I'm participating in NAVSEA's Commander's Development Program, which plucked me from the joys of SUPSHIP New Orleans to spend thirty months wandering around Washington as an overage engineer-in-training. Erin and I survived the ED Officers Ball as the token civilians and managed to run into a host of classmates, typically in line for the bar." . . . **Barry Kornstein** has this news to report: "In my spare time I am the head track & field coach at an all-girls private high school in Louisville. We are one of the top 10 teams in Kentucky."

I hope everyone is having a prosperous year. Drop me a line and let me know what's happening.—**Jonathan Miller**, secretary, 1708 Plaza Ct., Mountain View, CA. 94040; tel: (415) 961-2394, fax: (415) 813-1130; e-mail: <diamonds@well.com> or <jonathan\_miller@logitech.com>

# 85

Please send news for this column to: **Bill Messner**, secretary, 5927 Alder St., Pittsburgh, PA 15232; (412) 361-4180; e-mail: <bmessner@cmu.edu>, list-

server: <mit1985@mitvma.mit.edu>

# 86

## 10th Reunion

This month's column comes to you from Japan, thanks to the miracle of electronic communication. As of this writing, it is one week

after the March gas bombing of the Tokyo subway. Based on the crowds in the subway, you'd never guess that something that tragic had occurred just a few days ago. First off, some news from the family front. **Mary (Cox) Engebret** gave birth to a little girl, Jordan Kayla, on the 9th of December. . . . **Kevin**

**Przybocki** writes from Northern California that he got married in 1993 to a lovely woman he met while at Harvard Business School, and they've recently purchased a house in San Mateo. He is working at fast-growing Silicon Graphics in Mountain View as materials planning manager in the manufacturing division

Also, as of this writing, **James Person** and his wife, **Suzanne (Dunbar) Person**, were expecting a baby in April. Both are working for Qualcomm in San Diego. . . . **Noel Zamot** graduated from USAF Test Pilot School way back in June of '91 and was assigned to the B-2 Combined Test Force (CTF). After graduation, he and his wife, Diane, "went on an epic trip through Colorado. It was a huge tour (read: party on two wheels) called the 'Ride the Rockies.' We started out in Trinidad, near the New Mexico border, and in 6 days made our way all the way north to Denver." Noel writes: "**Jim Wilkerson** visited in the fall when he was down for Business Effort, an operation where off-station KC-135s come to Edwards and fly refueling for the CTF. **Rich Maurer** is getting married (or already has gotten married) down in Abilene, Tex., where he flies the B-1B at Dyess Air Force Base. He's also applying to Test Pilot School." Noel also received a call from Andy Thurling, '87. Noel was Andy's flight commander during our junior year (his sophomore year) at the "Tute. Andy had come down cross-country from Alaska, where he flies F-15s at Elmendorf AFB. "Never thought my kids would grow up, but, hey, they're making me proud." . . . **Roland Ovelette** in Brookline, N.H., writes that the grass is finally coming in at his new house. He recommends getting a house that's already built, rather than building your own. Neither will be exactly as you want, but the resale will be faster with pre-existing grass. He's now taken up gardening.

Navy Lieutenant **Renton Carsley** is almost finished with a six-month overseas deployment with Fighter Squadron 32, embarked aboard the aircraft carrier, USS *Dwight D. Eisenhower*. So far, the tour has included duty in the Persian Gulf near Iraq, and in the Adriatic Sea off of Bosnia-Herzegovina. He is one of 5,000 sailors and Marines aboard the ship, which departed Norfolk, Va., in October and has traveled more than 28,000 miles. While in the Persian Gulf, Renton supported the effort to deter Iraqi aggression on the Arabian peninsula and helped enforce the no-fly zone over southern Iraq. Most recently, his F-14B Tomcat squadron (based at NAS Oceana, Va.) and his shipmates have been supporting international efforts off the coast of Bosnia. . . . **Ginny Agresti** has begun a graduate program in statistics at Ohio State University in Columbus. She reports she has become, "a world-class geek!" (I'm not making this up). I sit in the front row, never skip class, do extra problems to prepare for exams, ask questions in class, and start homework on the day it's assigned." Nonetheless, she's still having fun and glad to be back in Columbus. If you ever need to know anything about the odds of winning the lottery, or the probability of selecting two matching socks out of a drawer full of loose ones, or the chances of no two people from a full elevator getting off on the same floor, feel free to contact her.

I had the pleasure of skiing in Alta, Utah, with **James Person** and **Dennis Arnow** during the middle of March. Dennis is in a

# ClassNotes

manufacturing management position with Intel in the SF Bay area. We all enjoyed some terrific ski conditions and great weather for a week. That's all for now. Keep those letters coming in.—**Bill Hobbib**, secretary, 5 Cappy Cir., West Newton, MA 02165; e-mail: <billhobbib@aol.com>

# 87

Greetings, I hope that everyone is having a great summer! **Greer Tan Swiston** and her husband, **Rob**, are planning a big bash for their son Parker's first birthday party. They are

also happy to mention that Greer's sister, Grace '86, and her husband Jeff Wang, '86, are expecting their second child at the end of April 1995. Greer recently returned from a business trip to London and she was asked while there, "Is this your first time to London?" to which she replied, "Yes, I have never been anywhere in Europe before." They quickly responded, "Well, you still haven't." **Sharon Chang** and her husband **Jamey Hicks** joined the Swistons at their Super Bowl party at the end of January. Sharon recently joined Greer at Fidelity, where there are now six alumni/ae working in their area. They also recently heard from **Jay Cohan**, who is still bicycling through New Zealand with his girlfriend, Cindy. According to his postcard, their goal is to keep crossing the equator at the appropriate time in order to stay in summer year round.

Greer also wanted to update the class about the experiences of her protegee and friend, Lou Ann Kroutil, who left the welfare system's Aid for Dependent Children over two years ago after earning an BS degree in math from Harvard, all while raising three young children. She has since met and married the man of her dreams, and is currently a law student at Northeastern University. In addition, she works part-time as a mathematics tutor at Harvard. Lou Ann sought out the Society of Women Engineers four years ago for help and guidance in her quest for an education. Greer became her mentor, and spent an hour or two with her per week, helping with homework or just listening to her problems and providing moral support. Lou Ann had to fight the welfare system "tooth and nail" in order to finally escape it. For two years, she and her family survived below the poverty line on wages which she earned rather than sit back and take welfare checks which would have provided her with a higher standard of living. According to Lou Ann, there are many women currently trying to get off Aid for Dependent Children who could use the moral support provided by programs like the SWE, but they do not have enough volunteers.

**Bryan Moser** (who served a year as Undergraduate Association president while we were at MIT, I believe) updates us from his home in Tokyo. After getting an SM in the MIT Technology and Public Policy (TPP) program in 1989, Bryan joined Nissan as a research engineer in Japan for what he thought would be a one-year stint there. He then joined United Technologies in Tokyo, where he worked for

four years at strengthening the ties between research programs at UTC and those associated with other companies and universities. Since this past January, Bryan has been a visiting researcher at the University of Tokyo, where he is working with Professor F. Kimura to create activity models (which combine product, process, and organization modeling) to enable globally distributed design. He is currently planning to return to the United States by September 1996 to begin doctoral studies. Bryan is in close contact with Jackie and Benny Linder as well as Chris Linn and Trish (Kellison) Linn, '84, in San Francisco. Some of Bryan's Theta Chi comrades have visited him in Japan. Most recently, Diego Castrillon and Alan Davidson, '89, joined Bryan for a mad dash around the country. "Dr. Diego" is doing well at Southwestern, in Dallas, where he has finished a PhD and is close to completing an MD. Bryan encourages any MITers passing through Tokyo to contact him via e-mail at <brmoser@utrc.utc.com>.

Speaking of the Linders and the Linns, Chris e-mailed me to say that reading about Ben and Jackie's new son compelled him to write in with news of his own. Emilia Annette Kellison-Linn was born on April 4, 1994. "Emily" is their first child. She is now almost walking, and talking a constant stream of baby talk. The Linns are currently living in Belmont (south of San Francisco), and quite often visit with the Linders. Chris, Trish, and Emily are now an all-Apple family: Trish has been working for Apple for a number of years and Chris just joined her there in March, as a software engineer on the OpenDoc team. Emily completes the picture by going to the Apple child care center.

Eric Koefoot and Eileen (Krolkowski) Koefoot, '89, are pleased to announce the birth of Daniel, who was born on December 6, 1994. Both are currently at Ford. Eric is the finance project manager for the Ford Taurus, while Eileen is on leave from her job as an engineer in Ford's powertrain operations.

Dave Schultz returned to Boston in late February for Chi Phi's annual banquet. He ended up drinking and playing poker with fellow '87 Chi Phis Dave Kemper, who currently lives in the Bay Area, Bill Irving, who is finishing up at MIT this year, Anthony Irving, graduating from MIT next year, and Jeff Murley, '88, who teaches special needs students. In addition, Dave met up with fellow Course XII alumni John Goodman and Joe Cerutti, '86. John lives in Boston, and works for a publishing company. He has a great schedule, as he works only four days per week, and he is anxiously awaiting the beginning of summer so that he can spend some of that free time bicycling. Dave and John are both interested in hearing the whereabouts of other Course XII '87ers. As for his current status, Dave is looking forward to graduating with a PhD in atmospheric science next June. He is also training for a flatwater sprint kayak competition this summer, in hopes of competing at Nationals in Seattle this August.

Jennifer Wiseman is in the process of completing a PhD in astronomy at Harvard University, where she specializes in interstellar regions of star formation. She has enjoyed her role as a resident tutor in a Harvard "House," although her students tire of hearing Jennifer tell them



**CANDLEWOOD LAKE, New Fairfield, Conn., was the setting for the wedding of Nancy Perugini, '88, and Dave Riggs. Also attending were (from left): Sheila (Neville) Flory, '88, Bob Flory, SM '89, Carla Kapikian, '88, Joycelyn (Valderrama) Koehler, '88, Dave Koehler, '87, the bride and groom, Catherine (Suriano) Singer, '88, and Andrew Singer, '89.**

how much harder MIT students work! She also joined the Cambridgeport Baptist Church, and has spent much time with both MIT and Harvard graduate students who are members there. This fall, Jennifer will take a position as a Jansky postdoctoral fellow at the National Radio Astronomy Observatory. . . . Also graduating this spring is Larry Buxbaum, who will receive both MD and PhD degrees from Johns Hopkins University in May. He will then begin an internship and residency at the University of Pennsylvania's Department of Medicine. After the residency, Larry plans to continue his research work in the field of parasitology. . . . Andreas Klein finishes up medical school at Yale this spring, and is currently applying for residency positions in Boston, in the area of internal medicine.

Sonia Leon Kuenzig has e-mailed to let us know that she will be trading in her business suits for a more casual look as she is going from Epsilon, an American Express subsidiary, to Vectris, a 15-person startup company. She thinks that she will enjoy the change in environment. . . . Also headed for a startup company is Joe LaRocca, who heads to Palo Alto after almost three years at the cc:Mail Division of Lotus Development Corp. Though he cannot tell us what he is working on, Joe is very excited about the project and the people with whom he will be working.

Simson Garfinkel's book *PGP: Pretty Good Privacy* is doing more than "pretty good" in the bookstores, as it has just gone into second printing. I saw it prominently displayed in the front window of the University Co-op Bookstore during a recent trip to Austin, Texas. In addition, Simson's wedding pictures can be viewed over the World Wide Web. The address is <<http://pleasant.cambridge.ma.us/wedding/>>, and he advises that you must use a viewer which supports inline JPEGs.

That's all from this end. Keep cool, and keep writing in!—Jack Leifer, secretary, 2908 Roses Run, Aiken, SC 29803; tel: (803) 642-3900 (home), (803) 648-6851 (work), fax: (803) 642-2700; e-mail: <[leifer@scarolina.edu](mailto:leifer@scarolina.edu)>, list-serv: <[MIT1987@mitvma.mit.edu](mailto:MIT1987@mitvma.mit.edu)>

# 88

Greetings classmates! Don Woodlock married Agnes Lynch last September. They had a beautiful downtown Boston wedding at Trinity church (the big one in Copley

Sq.) and had their reception at the Park Plaza Hotel. The guests danced to Calypso Hurricane (they played at Baker a couple of times). A conga line made its way outside and through the back seat of a taxi. Don gave a special guitar performance and sang the oldie song, "Something tells me I'm into something good," for Agnes. MIT alumni present included TJ Cradick (he was in the wedding party), Jack Kotovsky, '90, Alec Jessiman (and wife Elaine), and Andy Barrows, '89. Also Dean Chang, '89, visited for a few minutes since he was staying in the hotel. Don is a product manager at IDX in Boston for their managed care products. He heads up the development of products for the administrative and financial management of HMOs. Agnes is a clinical research coordinator at Mass General Hospital. The happy couple is currently living in Belmont and enjoying married life.

Joe Harrington graduated from MIT in October with a PhD in EAPS and moved to Maryland in March. Joe is a postdoc at the Goddard Space Flight Center with Drake Deming and Mike Flasar, '67, where he will continue to study Jupiter's atmosphere. . . . Chris Cook recently left the Navy and started law school at the University of Florida College

of Law. He bought a new house in Gainesville and is enjoying the excitement of watching collegiate sports again. . . . **Peggy Chang** writes that after spending two years in the Bay Area at Stanford Business School, she is back in Los Angeles working for the the *Los Angeles Times*. Peggy is in the New Business Development Group which is creating interactive and electronic versions of the newspaper and its advertising.

Another classmate, **Lily Huang**, has also moved to Los Angeles (she's engaged to someone she met while at Wharton) and is also working for the *Los Angeles Times*. . . . **Alison (Walsh) McCarty** is part of the Wren Group, which recently announced its incorporation. The Wren Group is dedicated to helping growing businesses in the U.S. and Eastern Europe. Since graduating from MIT, Alison received an MBA from Harvard and worked in management consulting with Arthur D. Little. . . . **Hey-Jin Kong** and **Kevin Oliveira** are engaged to be married in April 1995. She will finish her residency in internal medicine at Boston City Hospital in June and relocate to Northern Virginia at that time. (I realize that by the time this column makes its way to you Hey-Jin will already be in Virginia.)

**Mike Turek** plans to attend business school in the fall and is engaged to be married in June 1996. . . . **Larry Candell** and wife Amy (Bertin), '87, just closed on a house in Arlington, Mass.

Have a wonderful summer and find time to write.—**Catherine Suriano Singer**, secretary, 131 Main St., Andover, MA 01810; e-mail: <singer@mit.edu>

Internet! If anyone would like to see a picture of Nathan, his Web homepage is <<http://sun-valley.stanford.edu/users/r1marks/nathan.html>>. Besides being a new daddy, Rick has been busy studying at Stanford. He recently defended his PhD thesis in the area of computer vision and robotics. He is now finishing the writing while working in computer vision research and development for Teles Research Corporation in Palo Alto.

**Dave Berners** is also out West. After MIT, Dave received a master's in electrical engineering at Caltech. Then he worked at NASA/JPL (power conversion) and then at the Lawrence National Lab in Berkeley (particle accelerator). Now Dave is getting a PhD at the Center for Computer Research in Music and Acoustics at Stanford. Dave is studying acoustics and signal processing and has about one to two years before he finishes up his studies. . . . After five years, **Billo Naravane** has finally updated us on his whereabouts! After MIT, Billo worked for two years at Oracle headquarters as a database consultant and then as a systems developer. Then he went to Stanford to get a master's in electrical engineering. Now he is getting a PhD at the University of Texas, Austin while working part-time in IBM's RS/6000 division.

Early this year, **Erica Wickstrom** escaped the unusually rough California winter (really!) and traveled out to the East Coast. There she saw **Serap Savari**, who is in graduate school at MIT, **Linda Kah**, who is in graduate school in geology at Harvard, **Laura Scolnick**, who is in graduate school in chemistry at the University

# ClassNotes

accepted a job at the new Public Policy Institute of California. This institute is being founded with an endowment from Bill Hewlett to conduct research of interest to policymakers in California. Joanne is interested in continuing her work in the area of health economics and starting a project on turnover in engineering labor markets. Her husband, **Zain Saidin** (they were married in November '93), is still working at KLA Instruments, which makes equipment for the semiconductor industry. He is a project lead for the Starlight project, which has developed since he started there. Joanne and Zain live in Sunnyvale and unlike the rest of us in the Bay Area, they actually own their house! . . . **Chris Fennema Notestine** is finishing up a PhD in cognitive science and psychology at UCSD. She will then be a post-doctoral fellow at the McDonnell-Pew Center for Cognitive Neuroscience, working on MRI (magnetic resonance imaging) research on memory in aging, amnesia, and Alzheimer's disease. Chris will be using MRI technology to look at the neuroanatomy of the brain, how it changes over time, where damage exists, and how it relates to peoples' performance on measures of cognitive ability.

**Toby Sanders** was at the annual "Brockman" ski trip in Crested Butte, Colo. Other MITers there include **Laura Fleming**, **Julie**

**Wissink** and her husband, **Sayan Chakraborty**, '89, **Denis Gulsen**, '88, **Andy Brockman**, '88, **Chris Racicot**, '88, **Steve "Benny" Stein**, '88, and **Cathy Sybert Olkin**, '88. **Steve Brobst**, who drew on his years of Baker floor tutor experience to arrange the accommodations, was also there for the fun.

Other news: **Kedron Wolcott** is working at Tribe in Alameda, Calif. . . . **Julie Wissink** is starting a residency in internal medicine at Stanford. . . . **Elizabeth Quinn** is at Highlands (Oakland, Calif.) for a residency in internal medicine. . . . **Sheri Cohen** is doing an internship at Highlands and finishing up a residency in radiation oncology at Stanford. . . . **Ken Lu** is now working as an applications engineer at Insignia, Inc., in Mountain View. . . . **Peggy Liu**, who works at Netmanage in Cupertino, gave a presentation about the

Internet at the MIT Entrepreneur's Forum and she also gave a software demo at CyberSmith in Harvard Square. . . . **Julie (Temple) Cohen** is working in the Information Technology department at Morgan Stanley in New York and **Walter Chung** is pursuing a PhD in control theory in the Aerospace Department at UCLA.

**Lynn Chewning Pekmezian** and her husband, **Dean**, bought a brand new house in mid-December and managed to move in just before Christmas! Lynn is presently working as a systems engineer for Lockheed-Martin Corporation's Flight Test department. She's working on the C130-J and F-22 flight test data center dealing with integrating the telemetry front end equipment. Thanks to everyone who wrote in! That's it for this time.

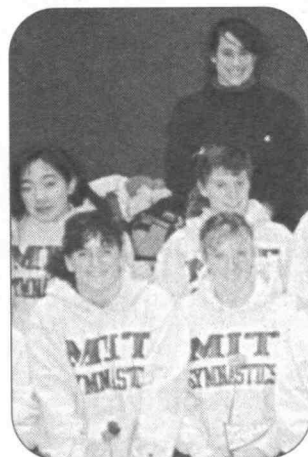
# 89

Well...I actually received two letters in the U.S. mail in addition to several e-mail notes, and would have had a lot to say

in this column. Unfortunately, I have let the deadline slip and am unable to get the article into *Tech Review* in time for editing. The editors of the Class Notes column were nice enough to let me put in this note of apology, though.

The good news is that those of you on the e-mail list will receive the column as soon as I finish with it, so just send me your e-mail address, and I will add you to the Class e-mail list and send out a copy of what would have appeared in this column (which will appear in print in next month's Class Notes).

So, please send more news and notes!—**Henry Houh**, secretary, 4 Ames St., Cambridge, MA 02142; tel: (617) 225-6680, fax: (617) 253-2673; e-mail: <hhh@mit.edu> or <henry\_houh@mit.edu>. And remember to check out the first World Wide Web URL to be published in Tech Review! <<http://www.tns.lcs.mit.edu/mit89/>>



*For news of sisters Rosemary Rocchio, '90 (lower left), and Catherine Rocchio, '89 (standing), and their extraordinary family, please see page MIT 3.*

of Pennsylvania, **Howie Stuart**, '88, who is in graduate school in Rochester, N.Y., **Anne-Marie (Conron) Malak** and **Mike Malak**, '89. Anne passed the New York State bar exam and is now working in Albany. Erica also went on a skiing trip to Tahoe with **Sheri Cohen**, **Adam Brand**, **Kedron Wolcott**, **Matt McCluskey**, '91, and **Roger Chen**, '91. After all the traveling, Erica returned to her PhD studies at Stanford and gave a talk entitled "Ouch! Repairing World Damage is an Extension of Development."

**Joanne Spetz** is planning on finishing a PhD in economics at Stanford this summer. Her dissertation is on the demand for and wages of nurses in California and elsewhere in the United States. In the meantime, Joanne has already

# 90

On November 12, 1994, **Rick Marks** and his wife, **Laura**, had a baby boy. His name is **Nathan Lee Marks**. Although **Nathan** is still young, he already has a presence on the

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## 91 5th Reunion

"Can you say 'Snohomish?'" asks Jason Sherman, who has just moved to Snohomish, a small town northeast of Seattle. Jason and his wife, Patricia Anderson (Wellesley '91), recently purchased their first home in Snohomish. "Having lots of fun!"

Andrei Saunders also enjoyed a bit of fun recently on his ski trip in Breckenridge, Colo., with Jake DeSantis, Jeff Drake, Mike deAsla, Chris Gordon, Chris Carlson, and Shane LaHousse, '90. The new Denver airport had opened the day that Jake and Andrei landed, and they were interviewed for a local television station. After Andrei's return to Manhattan, he again was interviewed for a German television station about the state of American financial markets (Andrei works for Goldman Sachs).

Michelle Hou works in Silicon Valley, Calif., as manager of strategic business and new product introductions in National Semiconductor's corporate technology management group. She and Daniel Chang, SM '92, were married on March 5, 1994, in a "fairy-tale wedding" in the Our Lady of Mercy Cathedral in Potomac, Md., with five bridesmaids in attendance, including fellow MIT alumna Linda Sun, Adelina Yen, and Leslie Liu, '89. Michelle and Daniel enjoyed a month-long honeymoon touring London, Paris, Monte Carlo, and cruising the Mediterranean. The couple now reside in the San Francisco area. Michelle may be reached at <cmmhsc@tevm2.nsc.com> and Daniel is at <daniel\_chang@trimble.com>.

Since 1993, John Conger has worked at Adroit Systems, Inc., a small engineering consulting firm in Alexandria, Va. He writes, "I'm also enrolled at George Washington University full-time getting a second master's degree (the first was in aero/astro). This one is in space policy, which is a lot of fun." ... James Donahue is a graduate student at Harvard University. ... The U.S. Navy reports that Christopher Morin was recently designated a Naval Aviator. He was awarded the "Wings of Gold" after successfully completing training in Corpus Christi, Texas.

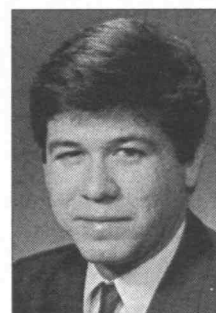
Please share your news with us, even if you can't say "Snohomish." Send your letters and postcards to, or call, Andrew Strehle, secretary, 59 Commonwealth Ave., Apt. 4R, Boston, MA 02116; (617) 450-0637. Or send your e-mail to Renee (Mong) Miller, <miller-rl@post7.laafb.af.mil>.

## 92

Tiffany Williams writes that she has been working for Andersen Consulting in New Jersey for almost two years as a systems consultant. She is enjoying her work. Her first assignment was for a large financial firm at the World Trade Center in New York. More recently she was in New Jersey designing a client/tax system. Andersen has now submitted her name for assignments in Puerto Rico or Santa Fe, N.M. Tiffany is very excited about

her prospects for travel. To keep busy, besides work, she plays basketball once a week with 11 guys from work. Tiffany says she can hold her own. Tiffany has been in touch with Holly Simpson and Lisa Malloy who are at medical school. She saw Gretchen Matlock over Christmas in Ohio. Gretchen is working for the government and bought a house about a year and a half ago. Theresa Derderian is living and working in Pennsylvania.

Suzanne Garber recently switched jobs and moved back to Minnesota. ... Reynaldo



Villarreal has joined the GE Research and Development Center as a mechanical engineer. ... Tim Salter returned from a six-month deployment to the western Pacific Ocean aboard the attack submarine USS Salt Lake City. ... Rajesh Raghavan had a letter published in *Newsweek* on February 13, 1995. Raj is working in Boston at MIL3 these days. ... Sandy Vasan is finishing her third year at Harvard Medical School and working at MGH. She saw Feroze Deen in India last winter. Feroze went traveling around the world and is starting business school in September. ... Jung-hua Kuo finished her third year of law school at Berkeley. ... Sima Doshi is living in Montreal and attending medical school at McGill University. Also at McGill Medical School is Namish Patel, '93.

That's all for now except that I have moved.—Leslie A. Barnett, secretary, 201 E. 83 St., Apt. 2E, New York, NY 10028

## 93

I hope everyone is having a good summer. I would like to thank those people mentioned in Class Notes who did in fact drop me a line: Julia Stowell, Rebecca Wittry, and Jeroen

Timmermans. For the next issue, I would like to hear from Cheryl Boyer, Michael Bradshaw, Sharlene Hammond, and Jonathan Li.

Julia writes that she is "down here in Champaign-Urbana at the University of Illinois." She is in the Department of Cell and Structural Biology doing work on eye development in frogs in the lab of Jon Henry. Says Julia, "(it's) nifty stuff if you don't mind microsurgery on tadpole eyes. ..." Julia is in touch with several members of the class of '93. She lives with Sherry Ipri, who is also attending the University of Illinois in the Department of Materials Science and Engineering. Sherry is working on microscopic fracture mechanisms and is very involved in her church.

This summer Julia traveled to London and Albuquerque, N.Mex. In London she stayed with Carrie Allen and met Carrie's fiancé, Albert. Carrie is doing a PhD in aerospace engineering at Oxford. Julie Stein, who is in Albuquerque, recently returned the favor of Julia's visit when she attended the wedding of a friend in Illinois.

Kristina Yoder can be found working at Stanford University. Julia reports that Kristina sounds really happy in her new job. Also at

Stanford is **Kathy Shim** who is in the lab of Roger Kornberg. Finally, Julia mentioned she ran into **Eleanor Kim**, who is in her first year at University of Illinois Medical School, and **Michelle Caruso**, who is at Columbia Medical School and is now engaged.

While we are on the topic of engagements, I recently received a letter from **Michelle Greene** announcing that she got engaged last week to Jonathan Rosenberg, '94, at Disney World. Michelle is currently living in New York and working in market research while Jonathan is finishing up a master's degree at Bell Labs. They will be getting married this coming fall. . . . **Becky Wittry** is working in Austin, Tex., as a "diffusion/ion implant/thin films process engineer" at Motorola. She is living with **Diane Hern**. Becky occasionally sees **Chance Harris**, **Jen Philhower**, and **Troy Morrison** who are also down in Texas. . . . **Jeroen Timmermans** is in Texas too, although he is currently living in Houston. After MIT, Jeroen went to Stanford for a one-year master's program in civil/structural engineering. During that time he visited **Bill Jackson**, who is at Berkeley. Jeroen is now working at Exxon Production Research Company in the Off-shore Division where he "basically designs pipeline." Jeroen keeps in touch with **Colleen Johnson** who is still at MIT attending graduate school and "just anxious to get away from MIT." . . . In other notes, **Kenneth Duda** is looking forward to his second year in Stanford's Computer Science PhD Program. When not in his lab, he and his wife, Jennifer (Hwang) Duda, '91, hang out with **Jim Hansen**, **Erkem Soylemez**, **Chris Hoadley**, '91, **Dirk Karis**, '91, **Kim Heroy**, and **Greg Rogalski**, '92, **Cathy Lachapella**, '92, and **Leanne Clark**, '94. **Christine Ying**, '93 has also been up for a visit from Pasadena.

**Sophia Yen** and **Steve Ko** were married last July at the Pulgas Water Temple in San Carlos, Calif. (See photo for MIT attendance.) **Mia Sakata** was a maid of honor. **Helen Chang**, **Mark Lee**, '94, **Lisa Chow**, **Liz Leung**, '94, and **Mike Yu** were also members of the wedding party. The couple honeymooned in Hawaii and now live in San Francisco. Sophia is in her second year at UCSF Medical School, and Steve is writing system software at Apple Computer.

**Benson Wen** is living in Somerville with three other MITers, **Erik Anderson**, '90, **Cherry Ogata**, '94, and **Beth Holmes**, '94. Benson has started his own 3-D virtual reality CD-Rom publishing company, ThinkFish Productions. . . . **Wendy Sanders** is still working at the Children's Television Workshop as a software producer. Wendy lives with her sister, **Toby Sanders**, '90. She recently went white water rafting on the Salmon River with **Meredith McKenzie** and **Les Kalman**, '92. Meredith is working for Intel in Phoenix.

I also heard from **Steven Lustig**. He graduated from Georgia Institute of Technology in mid-March with a master's in mechanical engineering and a certificate in the management of technology. His master's thesis was on the microscopic analysis of large deforma-

tion of several metals. After graduation, Steve went to Europe with **Marcelo Chan**, who received a master's in mechanical engineering from Georgia Tech in June, and **Michael Cabot**, who last heard was working in Japan. The three of them hit Lisbon, Madrid, Barcelona, Venice, Florence, and Rome. Following the trip Steven headed up to Chicago to start a job as a manufacturing/automation engineer for the Motorola division that makes cellular phone batteries.

From the "We want to hear from you!" Alumni/ae Fund telethon slips collected by *Technology Review*, I have the following news. **Mark Enstrom** has transferred from Maryland to Northern California. He is working out of a sales office for Telecommunications Techniques Corporation and travelling "A LOT and loving it." . . . **Nelson Sharfman**, '92 and **Gretchen Martin** were married in November. Gretchen works as a technical supervisor in manufacturing at the Gillette Co. and Nelson works as a materials engineer for Polaroid. . . . **Laurence Ward** finished a master's in electrical engineering at Georgia Tech and is currently working at David Sarnoff Research Center in Princeton, N.J. . . . **Kathy Peck** is working as a technical writer at Open Environment. She stays in touch with **Duane Laurence**, '94, **Tony Hsu**, '92, **James Njerv**, and **Vishnu Venkatesh**. . . . **Pete Rauch** is a consultant for AmeriData Consulting and at this moment may be climbing one of several mountains in either New

# ClassNotes

England or New York.

As for myself, I am still living in Cambridge and working at the Dana Farber Cancer Institute. This past winter I went skiing with **Ivana Markovic**, who was in Boston to do some recruiting for Michelin, **Mark Bockman**, and **Peter Hinterregger**. Pete left in February for an urban planning and development master's program in Sydney, Australia. I also attended the wedding of **Celia Flemming** and **Matt Detrich**, '91, in May. I hope to have photos soon. Soon to be married are **Patricia Birgeneau** and **Christopher Prince**, '92. **Kelly Sullivan**, **Ajanta Guha**, '92 and I will be in the wedding party. Patty and I will also be bridesmaids in the wedding of my roommate, **Ajanta**, in September. Kelly just finished her second year at Harvard Medical School. Speaking of which, I should extend good luck/congratulations to all second/third year medical students on the Medical Boards.

I guess that's all for now. PLEASE write me or use the Alumni/ae Association pledge cards. Without your help, I can't keep this column full.—**Mari Madsen**, secretary, 85 Alberta Rd., Brookline, MA 02167; **Sophia Yen**, e-mail assistant: <syen@itsa.ucsf.edu>



**Some of the MIT alums who attended the wedding of '93ers Steve Ko and Sophia Yen (inset) in San Carlos, Calif., gathered in front of the columns of the the Pulgas Water Temple. Kneeling (l to r): Mark Lee, '94, Mike Rizen, '91, and Mike Yu, '93. Second row: Sarah Keightly, SuWei Wu, '92, Pauline Liauw, '94, Liz Leung, '94, Helen Chang, '93, Mia Sakata, '93, Susan Yeh, '94, Lisa Chow, '93, Cherry Wongtrakool, '93, Liz Ho, '93, Ruth Hwang, '93, Eileen Stephens, Reshma Patel, '93, Anna Jen, '93, and Shen-yi Sieh, '93. Back row: Carl Fortin, '91, Ali Alavi, '94, Oliver Chow, '93, Yoshi Ito, '93, Jong Lee, '93, and Eric Ly, SM '93.**

# ARE YOU PLAYING GAMES?

# 94

Hello again! Having only recently assumed the mantle of class secretary, this column is largely catching up on Class Notes information. But for future columns, I need YOU

to send me information about your latest activities! And don't forget to tell me about your classmates!

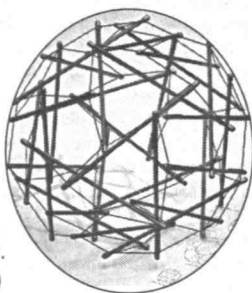
Taking this advice to heart, Lucy Tancredi sent me a detailed account on several Burton Bombers from the class of 1994: "Alicia Allen is still at MIT getting a master's in city planning and working at the Thirsty Ear. She will graduate this year and hopes to work in housing. **Lebzy Gonzalez** is in a PhD program in macromolecular science and engineering at the University of Michigan. **Umit Kumcuoglu** joined Goldman Sachs fixed income, working on derivatives. He lives on the Upper West Side and is 'exploring the mysteries of NYC. No marriage, no kids, no trouble with the police, and not a millionaire yet.' **Katy Oldham** is working for Motorola in Tempe, Ariz. **Rene Parra** is working at Texas Instruments developing voice recognition technology for the telecommunications industry. **Jose 'Peco' Pereyo** is in medical school at the University of Puerto Rico. **Eduardo Perez** is also in medical school, at the State University of New York Health Science Center in Syracuse. **Maribelle Rodriguez** is getting a master's degree in environmental engineering at Johns Hopkins University. She will graduate in May of this year and is currently looking for a job. **Anant Setlur** is a PhD student in materials science at Northwestern University. His eventual career will probably involve industrial research. **Melissa Wright** is doing systems engineering on the SeaStar satellite at Orbital Sciences Corp. in Virginia. **Mark Urmacher** is at Oracle Corp. in San Francisco." As for Lucy herself: "I am still in Cambridge, getting a master's in technology in education at the Harvard Graduate School of Education. When I graduate, I'd like to evaluate, design, and create educational software."

In the better-late-than-never category, here's an attempt to catch up on the what you've reported in the past year. **Jung Yu** is pursuing both a master of engineering degree from MIT EECS Department and a master of science in transportation from the MIT Civil Engineering Department. . . . **Mario Jimenez** reported studying physics at Columbia University. . . . **Ann Esin** is studying at Harvard University's Astronomy Department. . . . **Justin Corvin** has "had it with Boston weather!" and is studying mathematics at Stanford. . . . **James Morris** is studying theoretical physics at Yale University. . . . **John Mueller** is working in Chicago for Andersen Consulting. . . . **Karen Ho** is working for Swiss Bank in Chicago and New York doing information technology. . . . **Ann Chen** is attending Harvard Medical School. . . . **Scott A. McDermott** is working on satellite software for Loral Federal Systems Corp. and "is looking forward to hosting Tute friends when their escapades take them near the nation's capital." . . . **Awina Chandiramani** is working as an investment banking analyst at Credit Suisse First Boston.

What's new with you? Completed another degree? Run into a few classmates? Send me a brief note: **Jeff Van Dyke**, secretary, 6360 N. 31st, Richland, MI 49083 or send me email: <jvandyke@mit.edu>.

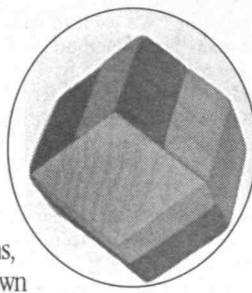
## STIK-TRIX

A fun and simple puzzle for exploring shape, structure, and design. With 6 sticks, 20 different geometric shapes as well as other free-form designs can be created.  
Ages 8 and up, \$8.95



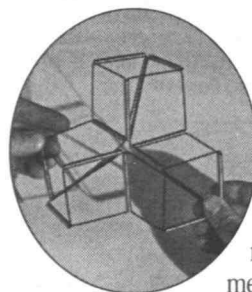
## DODECA

Dodeca is a mildly challenging puzzle. There are three different solutions, each with their own challenge. Dodeca's unusual geometry can cause the solutions to be quite elusive!  
Ages 8 and up, \$7.95



## FLEXISTAR 3

Made from 3 pairs of linked tetrahedrons, Flexistar's magical movement will entice both children and adults



as it turns on its own axis in a continuous flowing pattern

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These squishy foam puzzles will test your mettle and creative energy with dozens of complex shapes to build and rebuild. Six different levels to master, from easy to brain buster!

Ages 8 and up, Package of 6, \$7.95



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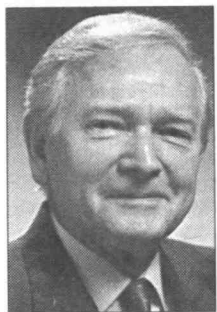
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# CourseNews

## CIVIL AND ENVIRONMENTAL ENGINEERING

Colonel John V. "Jack" Foley, SM '58, chairman of the board of the Metropolitan Water District of Southern California, was honored as the 1995 Engineer of the Year by the Institute for the Advancement of Engineering (IAE). This past February, Foley, a civil engineer and retired Army officer, was honored



John V. Foley

with the IAE's George Washington Award and inducted into the IAE College of Fellows. Foley's career includes command of a construction battalion of 850 engineers and 1,200 civilians in Thailand during the Vietnam War and leadership of the Army Corps of Engineers' public affairs office in Washington, D.C.

Since his retirement from the military in 1976, Foley has served as general manager of the Aliso Water Management Agency and, since 1979, as general manager of the Moulton Niguel Water District, both in Orange County. Foley has been a key figure in water and sanitation matters on state, regional, and local levels. In February 1994, Foley was appointed by California Governor Pete Wilson to serve on the Bay/Delta Oversight Council.

William E. Goodrich, SM '80, writes: "Since September 1993, I have been working as a resident engineer for Bechtel/Parsons Brinckerhoff on the Central Artery/Tunnel Project in Boston. I am currently responsible for three building construction contracts including the operations control center, administration building, and central maintenance facility."

... Steven W. Ordun, SM '83, writes: "I have been nurturing our species' most precious natural resource in the most undervalued position, homemaker. In other words, I've been at home for the past five years with my children, Emily Ann and Hannah Maureen." ... Joseph

P. Franklin, SM '61 (I, XXII), reports: "Since December 1993, I have been chairman of the board and CEO of Frequency Electronics, Inc., an AMEX company devoted to precision time and frequency sources for space and wireless communications." ... Major General Robert F. Seedlock, SM '40, USA (Ret.), was awarded the Outstanding Civilian Service Medal by the U.S. Army. The citation reads: "For 10 years of outstanding service as the principal U.S. representative to the Permanent International Association of Navigation Congresses (PIANC) Permanent Technical Committee on Inland Navigation. This he accomplished in a most professional and commendable manner. General Seedlock continuously monitored and coordinated between 20 and 30 technical working groups at any given time without financial compensation or reimbursement. His efforts contributed significantly by making available to the United States numerous technologies developed in other countries. His efforts reflect great credit upon himself, the U.S. Army Corps of Engineers, the Department of the Army, and the United States Government."

Carl Martland, '68 (XVIII), SM '72, CE '72, Oh Kyoung Kwon, PhD '94, and Joseph Sussman, PhD '68, won the annual Best Railroad Paper Award at the Transportation Research Forum meeting in November 1994 for "Developing Insights on Effects of Service Differentiation in Rail Freight Transportation Systems." Sussman, the J.R. East Professor of Civil & Environmental Engineering at MIT, has also been nominated as a member of the board of directors of Intelligent Transportation Systems America.

Wendy Dimbero Graham, PhD '89, was awarded the 1994 Emerging Scholar Award by the American Association of University Women Educational Foundation. She is an assistant professor of agricultural engineering at the University of Florida, where she develops computer models that trace the movement and degradation of contaminants in groundwater. ... Dara Entekhabi, PhD '90, of the Parsons Lab, and Cynthia Barnhart, SM '86, PhD '88, of the Pierce Lab, have both been promoted to associate professors at MIT. Barnhart and her husband, Mark, had their second daughter, Julia, on February 10, 1995.

Chebolu Lakshmana Rao, ScD '92, is an assistant professor in the Solid Mechanics Division of the Department of Applied Mechanics at the Indian Institute of Technology in Madras, India. ... After 10 years as an independent consultant on tropical diseases and water projects, William Jobin, '59, SM '61, is helping CONECO Environmental Corp. of Bridgewater, Mass., to establish a program in aquatic ecology. Along with MIT Professor Elfatih Eltahir, SM '93 (XII), ScD '93, and Professor James Maguire of the Harvard School of Public Health, Jobin presented an IAP course, The Ecology of the Nile River—Big Dams, Big Canals, and Big Problems. Over the past 15 years, Jobin has worked on African river surveys. Last year, he led a team of 16 international scientists and engineers on an environmental health assessment in the Senegal River Basin in West Africa. Their report was published in December 1994 through the Camp, Dresser and McKee project known as WASH for the United States Agency for International Development. Their study was part of an environmental assessment leading to World Bank appraisal of a loan requested by the Senegal River Basin Authority to install 200 MW of generating capacity at Manantali Dam in western Mali, and to build transmission lines to Dakar, Senegal; Bamako, Mali; and Nouakchott, Mauritania.

Michael A. Semeraro, Jr., SM '82, was named a principal of Langan Engineering and Environmental Services, Inc., in Elmwood Park, N.J. The firm provides comprehensive geotechnical and civil engineering, environmental and construction consulting services. An expert in the integration of computer resources (CADD) in the field of civil engineering, Semeraro has implemented a state of the art CADD system at Langan, incorporating GDS and MOSS systems. During his 15 years at Langan, Semeraro has directed numerous complex geotechnical, hydraulic/hydrologic, and site engineering projects. His professional affiliations include the American Society of Civil Engineers and the International Society of Soil Mechanics and Foundation Engineering. He is a member and past president of the North American MOSS Users Group and the GDS National Users Group for which he held the office of chair-

### DEGREE CODES

AE	Aeronautical Engineer
BE	Building Engineer
CE	Civil Engineer
CHE	Chemical Engineer
CSE	Computer Science Engineer
DPH	Doctor of Public Health
EAA	Aeronautical & Astronautical Engineer
EE	Electrical Engineer
EGD	Doctor of Engineering

ENE	Environmental Engineer
MAA	Master in Architecture Advanced Studies
MAE	Materials Engineer
MAR	Master in Architecture
MCP	Master in City Planning
ME	Mechanical Engineer
MET	Meteorologist
MIE	Mineral Engineer
MME	Marine Mechanical Engineer
MNG	Master in Engineering

MPH	Master in Public Health
MTE	Metallurgical Engineer
NA	Naval Architect
NE	Naval Engineer
NUE	Nuclear Engineer
OCE	Ocean Engineer
PhD	Doctor in Philosophy
ScD	Doctor of Science
SE	Sanitary Engineer
SM	Master of Science

man of the Civil Engineering Special Interest Group.

**Robert A. Karasek**, PhD '76, professor of work environment at the University of Massachusetts/Lowell, was a featured speaker at the 10th meeting of the Japanese Association of Stress Science. Karasek's presentation reviewed 18 studies of cardiovascular disease done with his demand-control research model and suggested new directions for research. According to the UMass/Lowell press release, the Japanese are particularly interested in work-related stress, which affects an estimated 72 percent of Japanese workers. A new phenomenon of workplace stress, called *karoshi*, is death from overworking. Karasek is co-author of *Healthy Work* and has been with the work environment faculty in the College of Engineering at UMass/Lowell since 1992. . . . Via e-mail, **Scott Ramming**, SM '94, writes: "My current plans are to continue gaining practical experience at Charles River Associates, and then return for doctoral studies—probably in the fall of 1996." Ramming can be reached at <msr@cra-bos.mhs.com-puserve.com>.

**Roger Foott**, ScD '73, died of cancer on October 4, 1994. His family has established a memorial fellowship in his name at MIT to help geotechnical graduate students attend meetings of professional societies.

The Association of Alumni and Alumnae was notified that **Jacques Naar**, SM '58, CE '58, passed away on May 25, 1994, in Palo Alto, Calif. and **Ralph E. Boeck**, SM '28, of Wauwatosa, Wis., died on November 22, 1994. No further details were provided.

*Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.*



## MECHANICAL ENGINEERING

MIT Professor **Thomas B. Sheridan**, ScD '59, internationally recognized for his teaching and research in control, man-made systems, human factors, and telerobotics, was appointed Ford Professor of Engineering and elected to the National Academy of Engineers. Sheridan has an unusual professional background, combining both engineering and psychology.

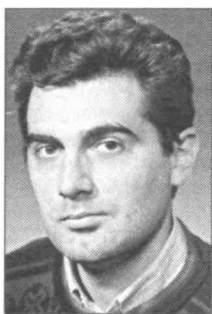


**Thomas Sheridan**

His research is relevant to many fields, especially aviation and space. He has academic appointments in both the Department of Mechanical Engineering and the Department of Aeronautics & Astronautics and is involved with the Center for Transportation Studies and the Research Laboratory of Electronics. His research has included human-computer interaction in aircraft and space piloting; high-speed trains and "smart" highway systems; undersea and industrial robotic systems; and computer-graphic displays and decision aids. He has taught many undergraduate and graduate subjects, ranging from the basic mechanics of solids to models of man-

machine systems. Sheridan is co-author of *Man-Machine Systems: Information Control and Decision Models of Human Performance* (1974), a seminal contribution to the field, and more recently author of *Telerobotics, Automation, and Human Supervisory Control* (1992). Both were published by MIT Press. Sheridan is senior editor of the MIT Press journal *Presence: Teleoperators and Virtual Environments*. Among his honors are election as a Fellow of both the IEEE and Human Factors Society (HFS); an honorary doctorate from Delft University of Technology, the Netherlands; the IEEE's Centennial Medal and Norbert Wiener Prize; and the HFS's Paul Fitts Award. Sheridan's citation, upon election to the NAE, reads: "For contributions to understanding and supporting human interaction with automated systems in space aviation, nuclear power, and undersea exploration."

**Richard H. Lyon**, PhD '55 (VIII), along with Sheridan and four other MIT faculty members, was also elected to the National Academy of Engineers. Lyon, the director of Industrial Programs for Structural Acoustics, was selected for his development of statistical energy analysis and machinery diagnostic techniques.



**Apostolos Karafillis**  
**Townsend**, SM '84, PhD '88, reports:

"My wife, Julie, and I are excited to be moving our two businesses onto the edge of the MIT campus at 139 Main St. in Kendall Square. Barrett Technology, Inc., has worldwide sales of robots based on MIT-licensed technology. Julie's company, Barrett Communications, Inc., is one of the most successful communications firms in New England. We offer sincere thanks to the MIT community." . . . From Rochester Hills, Mich., **Richard H. Johnson**, SM '80, writes: "I was recently transferred within Rockwell International Corp. to the Rockwell Automotive Electronics Group as the director of engineering. The first product of this newly formed group is a satellite navigation system based on GPS (global positioning satellites). . . . **Subra Suresh**, ScD '81, the Richard P. Simmons Professor of Metallurgy at MIT and professor of mechanical engineering, recently delivered the Shell Distinguished Lecture at Northwestern University. The lecture is sponsored annually by the Shell Oil Co. Suresh's lecture was based on his current research on the thermal properties of multi-layered materials being developed for applications involving structural coatings, electronic thin films, piezoelectric systems, and solid oxide fuel cells. He has also recently been named a Fellow of the American Ceramic Society. . . . **John C. Pflueger III**, '85, SM '88, PhD '91, writes: "I am living and working in Austin, Tex. Madilyn Anne Pflueger was born on September 13, 1994. Both mother and daughter are well."

**Apostolos P. Karafillis**, SM '92, PhD '94, has joined the GE R&D Center as a mechanical engineer. A native of Larissa, Greece, Karafillis is a member of the Society of Automotive Engineers. He and his wife, Stamatia Dova, live in Schenectady, N.Y.

**William T.**

**David P. DeWitt**, SM '72, a professor of mechanical engineering at Purdue University, was named a Fellow of the American Society of Mechanical Engineers. "For more than 30 years, DeWitt has been a leader in developing experimental methodologies for thermal radiative measurements," according to an ASME press release. As an educator, he has been instrumental in expanding design experiences throughout the curriculum, particularly through linkages with industry, and in developing course and laboratory materials in the thermosciences. . . . From London, **Josephine Anne Stein**, '72, PhD '85, sends word: "**Richard Davies**, SM '84 (TPP), and I are delighted to have become parents of **Graham Douglas Stein Davies**, a Course II baby born on November 10, 1994. He is strong and healthy and already exhibits an interest in mechanisms—at least mobiles. Soon he will be dismantling anything he can lay his hands on. Perhaps then he can design improved, baby-proof gadgets!"



**John Sirmalis**

**John E. Sirmalis**, '56, SM '58, of Barrington, R.I., has been named acting technical director of the Naval Undersea Warfare Center (NUWC). Sirmalis has been executive director of NUWC's Newport division since August 1992. A member of the federal governments' Senior Executive Service, his new responsibilities include overseeing the management of technical programs of NUWC's two divisions. NUWC operates the Navy's research, development, test and evaluation, engineering, and fleet support center for submarines, autonomous underwater systems, and offensive and defensive weapons systems associated with undersea warfare. Throughout his 38-year Navy career, Sirmalis has been involved in the full spectrum of underwater weapon and target design, development, and acquisition. In June 1994, Sirmalis was presented with the Meritorious Executive Presidential Rank Award by Secretary of the Navy John H. Dalton for his professional achievements.

The Association of Alumni and Alumnae was notified that **Zhong Cai**, SM '86, SM '90, was killed in a car accident on January 1, 1995. Cai's wife, Feng Yuan, and son were also involved in the accident.

*Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.*



## MATERIALS SCIENCE AND ENGINEERING

**Julie Tsai**, '88, a graduate student in Course III, was recognized with an "outstanding research presentation" award for "Polycrystalline Silicon-Germanium Alloys for Thin-Film Transistor Applications," a presentation that she gave at the Graduate Fellowship Program Annual conference in November 1994. . . . **Thomas Harris**, SM '87, PhD '89, was promoted to associate professor of chemistry and awarded tenure at the University of Tulsa. . . . MIT Pro-

fessor **Lionel C. Kimerling**, '65, PhD '69, was named the recipient the 1995 Electronics Division Award of the Electrochemical Society. The citation reads: "For his seminal contributions to our understanding of defects in semiconductors and for his leadership in the field."



**Mark Benz**

**Mark G. Benz**, SM '59, ScD '61, a metallurgist with the GE R&D Center since 1961, was awarded the center's highest honor, the Coolidge Fellowship Award. Benz was honored for his contributions to products manufactured by a wide variety of GE businesses, from superconducting magnetic resonance imaging

systems by GE Medical Systems, to jet engines by GE Aircraft Engines, to steam and gas turbines by GE Industrial and Power Systems. As a Coolidge Fellow, Benz will be granted a leave for one year to follow individual research pursuits. Early in his career, Benz invented a strong and highly flexible superconducting niobium-tin tape that led to GE's first entry into the business of manufacturing and selling superconducting magnets and materials. His later innovations in superconductivity helped GE to become the world's leading manufacturer of superconducting magnet systems, employed in the company's magnetic resonance scanners. Benz made major contributions to GE's revolutionary MRT (for Magnetic Resonance-guided Therapy) system, which allows a physician to stand over and work on a patient being scanned by a magnetic resonance imager. Benz also co-invented GE's process for making the world's strongest permanent magnets. From 1973 to 1987, Benz served as manager of the center's Physical Metallurgy Branch, where he lead successful projects in areas such as the development of barrier fuel cladding for GE's nuclear power generation systems, composites for aircraft and industrial gas turbines, and the metallurgical control of fatigue crack propagation in superalloys. In 1987, he returned to full-time research, where he is involved in the development of superconducting materials, spray forming methods for superalloys, refractory metals, and high-temperature composites. In 1970, Benz was awarded the Geisler Award of the Eastern New York Chapter of the American Society of Metallurgy International, which recognized his contributions to the science and technology of superconducting materials. In 1987, he was named a Fellow of ASM for his "technical research and management leadership in the development and exploitation of superconducting wire, permanent magnets, and heat-resistant materials." Earlier this year, he was presented with the Distinguished Career Award of the Hudson-Mohawk Section of the Mineral, Metals & Materials Society. Benz is also a member of the Materials Research Society. He has published more than 50 technical papers and holds 41 U.S. patents.

The Association of Alumni and Alumnae was notified that **John H. Halford, Jr.**, ScD '40, of Center Lovell, Maine, died on March 6, 1994, and **Risto T. Hukki**, ScD '44, of Espo, Finland, died on December 27, 1988.

No further information was provided.

*Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.*

## IV ARCHITECTURE

**Gaius G. Nelson**, SM '87, reports: "I started a new architecture practice in 1994 focusing on the design needs of older people. I received a Bush Foundation fellowship for a 10-week public policy internship with the American Association of Homes and Services for the Aging in Washington, D.C. . . . **Marc Maxwell**, MAR '85, writes: "I am entering my fifth year as a sole practitioner. Major upcoming projects include a gut renovation of the North End Community Health Center, facility planning and renovation design for Fenway Community Health Center, and the second phase of alterations to the Tremont on the Common condominiums." . . . From California, **Clark L. Watkins**, MAR '74: "I recently relocated from Palo Alto to Carmel. I plan to continue my architectural practice devoted to residential design in both geographical areas. My wife, Charlotte, is temporarily commuting to Menlo Park. Our kids, Megann and Brian, are adapting well to their new home and schools. It's beautiful here!" . . . **Walter Dackiw**, SM '85, and **Susane Havelka**, '86, along with their 3-year-old son, Jean-Nicholas, relocated to Berlin, Germany. Dackiw is working for Tishman Speyer Properties in Berlin on a major real estate development for Sony in Potsdamer Platz.

**Sarah K. Abrams**, SM '85 (CRE), was pro-

# CourseNews

moted to senior VP at USTrust. She is head of the bank's real estate owned and environmental review departments. Abrams serves on the steering committee of the new England Women in Real Estate and is a member of the YWCA board of directors. She is also a member of the Real Estate Finance Association, the Massachusetts and American Bar Associations, and the Cornell Real Estate Council. Prior to joining USTrust in 1992, she owned and operate The Trover Co., a real estate development and project management firm.

MIT Professor Emeritus **John T. Howard**, MAR '35, MCP '36, head of what is now the Department of Urban Studies and Planning from 1957 until 1970, died of a heart attack at his home in Newburyport, Mass., on February 2, 1995. After graduating from MIT in 1936, Howard traveled abroad on a fellowship. He then served as planning director for the city of Cleveland. In 1949, he returned to MIT as an associate professor. As a planner, Howard consulted widely. He was involved in redevelopment efforts in Baltimore, Boston, Hartford, Providence, Washington, Los Angeles, the San Francisco Bay area, and other smaller cities. He was a member and former president of the American Institute of Planners (AIP). Among his awards were the Distinguished Service Award of the AIP and the Yale Medal for Distinction in the Arts. After retiring, Howard was chairman of the planning board in Gloucester, Mass., and, at age 80,



**Former MIT Professor Henry A. Millon**, dean of the National Gallery's Center for Advanced Study in the Visual Arts, organized "Italian Renaissance Architecture" at the gallery. The exhibition consists of 14 wooden architectural models of Italian cathedrals that have survived from the Renaissance, as well as more than 70 related paintings, drawings, and prints. Paul Goldberger, in his critique of the exhibition that appeared in the February 7, 1995, New York Times, wrote, "The models are, quite simply, some of the most remarkable pieces of art I have ever seen—and you do not have to be interested in architecture to be bewitched by them."

became a member of the planning board after moving to Newburyport.

**Martin R. Friedmann**, SM '93, took his own life on February 1, 1995. Friedman worked at the Media Laboratory at the time of his death. Friedman's other endeavors included a virtual reality demo that is currently at the Chicago Science Museum and a World Wide Web page for the Rolling Stones. At one time, he was a contender for the world championship in skateboarding.

*Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.*

## V CHEMISTRY



**Lynda Jordan**

**Lynda Jordan**, PhD '85, a biochemist at North Carolina A&T State University, is featured in a series called *Discovering Women* that aired in March and April on PBS. Her professional and personal story, along with the stories of five other female scientists, was

presented in the series, which is aimed at encouraging pre-teens to pursue careers in science. Jordan is working on cracking the code for a key human enzyme, the protein phospholipase A2, or PLA-2, which has been linked to asthma, arthritis, pre-term labor, and several inflammatory disorders. An afternoon spent waiting with other women in the Boston projects for their welfare checks prompted Jordan to take her education seriously. Upon arrival, the mailman announced he had no checks for them and laughed. "I remember sitting there and saying to myself I will never be in a position where I cannot feed my children. That sparked me to pursue my education," Jordan said. She continued, "I used chemistry and education as a way to escape my surroundings." Jordan reported that she faced racism and classism that further isolated her at MIT. She survived the negativity by telling herself, "By the time I leave here, they will respect me for my mind. A mind coming from the Boston projects is just as smart." Jordan considers encouraging a new generation of African-American scientists to be part of her mission. "We need to collectively start working harder in our communities to make stronger linkages [with young people]," said Jordan.

**Richard V. Cartwright**, SM '66, PhD '67, reports: "I am currently performing research on improved automobile airbag propellants at TRW Vehicle Safety Systems in Washington, Mich."

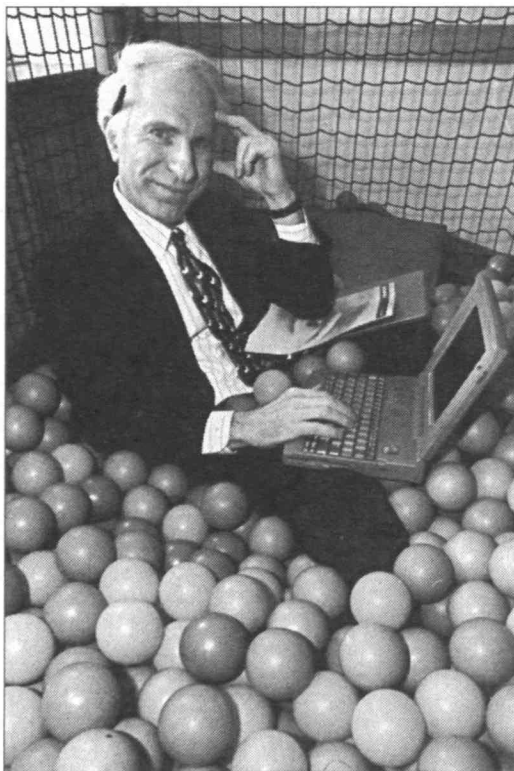
The Association of Alumni and Alumnae was notified of the deaths of **Dwight F. Mowery**, PhD '41, of Oldsmar, Fla., and **Charles T. Hathaway**, PhD '53, of Covina, Calif. Mowery

died on December 19, 1994 and Hathaway died on January 30, 1995. No further information was provided.

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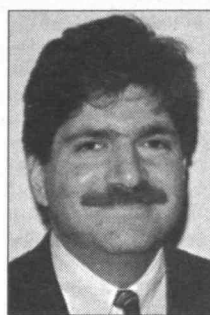
## VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Professor of Electrical and Ocean Engineering **Arthur B. Baggeroer**, SM '65, EE '65, ScD '68, and **William F. Schreiber**, professor emeritus of electrical engineering, are two of the six MIT faculty members elected to the National Academy of Engineering this year. Baggeroer, who is also a Ford Professor of Engineering, was recognized for his contributions in signal processing applied to sonar. Schreiber was chosen for his contributions to image-processing, television technology, video compression, and color graphics. . . . Another accolade for Course VI faculty: Professor **Henry I. Smith**, the **Joseph F.** and **Nancy P. Keithley** ('37, SM '38) Professor of Electrical Engineering and director of the MIT Nano-Structures Laboratory, has been named the recipient of the 1995



**Robert Shillman**, SM '72, PhD '74, the founder, president, CEO, and chairman of Cognex Corp. of Natick, Mass., never lets work get in the way of a good time, as he shows here at a Chuck E. Cheese restaurant. While nurturing a penchant for acting, Shillman has made Cognex the leading producer of machine vision systems. At an employee meeting, Shillman and three others donned leather duds and danced to a remake of the Village People's song "YMCA" while handing out employee bonuses.

**Cledo Brunetti Award** by the Institute of Electrical and Electronics Engineers (IEEE). The award recognizes Smith for his "contributions to micro-fabrication science and technology, notably microlithography."



**Ken Keverian**

In his six years with BCG, Keverian has focused on strategy for high-technology firms and the strategic implications of technology in a variety of businesses. He has extensive experience in the telecommunications and computer industries, has worked with clients on speeding up time-to-market and order-to-delivery processes, and has developed distribution, marketing, and pricing strategies. Prior to joining BCG, Keverian spent seven years at AT&T Bell Laboratories, where he designed and managed the development of telecommunications and computer products.

**Alan W. Starr**, '60, SM '61, writes: "I am still working in the Pentagon in the office of Program Analysis and Evaluation. I ran my first marathon last fall, but didn't qualify for Boston. My daughter at Harvard says MIT is known as one of the biggest party schools. Could this be true?" Starr can be reached via e-mail at <staraw@scpa1.pae.osd.mil>. . . . **Stephen T. Kent**, SM '76, EE '78, PhD '81, writes: "I chaired a panel for ACM that produced a report on cryptography and public policy. A short form of the report appeared in the August issue of CACM."

From Lexington, Ky., **Arthur Radun**, '78, SM '78, PhD '81, reports: "I am no longer at General Electric Corporate R&D. I am now at the University of Kentucky." . . . **Reid Simmons**, SM '83, PhD '88, and his wife, Pearl, "are pleased to announce that Joshua Morris joined his siblings, Noah and Rachel, on January 10, 1995. All are doing fine, although they are sleep-deprived."

The Association of Alumni and Alumnae was notified of the deaths of **Nils M. Bengtson**, SM '48, of East Falmouth, Mass., on January 20, 1995, and **James B. Spratley**, SM '22, of Richmond, Va., on December 3, 1994. No further information was provided.

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## VI-A INTERNSHIP PROGRAM

Director **Markus Zahn**, '68, SM '68, EE '69, ScD '70, reports a very successful application and interview process

for the new VI-A Class of 1995, held the first week in March. About 150 applied for about 65 expected positions with the 30 participating companies. It now remains to be seen, by the middle of April, just how the matching process finally works out.

Two companies joining VI-A this year are SatCon Technology Corp. of Cambridge, Mass., and Silicon Graphics of Mountain View, Calif. These companies are the first to formally participate in the new VI-A Fellowship Program.

According to Professor Zahn, "the VI-A Fellowship Program is a way of helping finance the graduate term away when MIT tuition is due, with only a minimum of additional expense to the companies over the past system of paying salaries. The Fellowship pays one term of MIT tuition, a monthly stipend that at a minimum matches that of a research assistantship, and one term of medical insurance. Two other VI-A companies have also indicated they will participate and many others are recommending joining to higher management. In addition, five of the VI-A companies have their own programs to help finance VI-A graduate students. I believe that momentum is building so that most, if not all, VI-A companies will have to offer some graduate support in order to remain competitive. The VI-A Program continues to offer a high-quality educational experience for those students who want to obtain practical experience."

One of our longtime company recruiters mentioned to me that "this was the best crop of students he'd seen in the last several years." My next article will give some results of this season's recruiting effort!

Many companies send their VI-A hires on campus to help with the selection process and I list them with the hope that Lydia and I haven't overlooked anyone: Laura E. Adams, '92, SM '92, of Lincoln Labs; Jeffrey D. Beck,

'71, SM '72 of Texas Instruments; Michael P. Chin, '86, SM '87 of Bell Labs; Charles B. Dieterich, '77, SM '78, of Sarnoff; Stephen P. Emeott, '89, SM '90, of Motorola; Jenny M. Ford, '81, SM '82, of Motorola; Robert P. Gilmore, '76, SM '77, of Qualcomm; Frank Gutterman, '92, SM '92, also of Qualcomm; Susan E. Margulies, '92, SM '93, of Hewlett-Packard; Ramana Rao, '83, SM '87, of Xerox Parc; Luis Rodriguez, '90, SM '93, of Xerox Parc; Nancy S. Stevens, '81, SM '82, of Bell Labs; Gary Tarnowski, '93, SM '94, of Loral; Mitchell Tasman, '82, of BB&N; Raymond L. Veith, '90, SM '90, of Tektronix; and Todd E. Knibbe, '93, SM '93, of Hughes.

The IEEE has announced its annual elections to its highest grade of Fellow and VI-A grad Gary K. Montress, '69, SM '71, EE '71, PhD '77, has been so honored. Montress is with Raytheon's Research Division in Lexington, Mass. He was recognized for his contributions to the development of surface acoustic wave based frequency sources and for leadership in their application to high performance military radar systems.

MIT named seven professors, including VI-A graduate Professor Thomas J. Greytak, '62, SM '63, PhD '67 (VIII) of the Department of Physics, as MacVicar Fellows for excellence in teaching and contributions to undergraduate education.

I note from the February edition of the IEEE Boston Section's publication *The Reflector* that two VI-A graduates are making technical presentations: Henry Houh, '89, '90 (VIII), SM '91, on the World Wide Web at IEEE's Infocom '95, and Professor Frederic R. Morgenthaler, '55, SM '56, PhD '60, on "Alternate Electromagnetic Power and Energy" to the Antennas & Propagation Society. Getting an early start in presentations is student Ben Y. Reis, who received the Best Student Paper Award in Speech Communication at the

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Acoustical Society of America meeting in Austin, Tex.

Lastly, and pleasantly, our regular list of VI-A contacts and office visitors, other than those already listed above as being on campus for the VI-A interviews: Paul M. Anderson, '90, SM '91, who was a TA for Professor J. Francis Reintjes and is now with Motorola; Richard W. Chin, '80, SM '81, who was conducting placement interviews for Hewlett-Packard Co. of Cupertino, Calif.; Geoffrey J. Bunza, '74, SM '77, EE '78, PhD '81, the VP of engineering & operations at Eagle Design Automation in Tigard, Ore. Bunza and I had dinner at Legal Seafood.

Dean R. Collins, '58, SM '59, who has moved from Texas Instruments in Dallas to the National Institute of Standards & Technology in Gaithersburg, Md.; John F. Cooper, '74, SM '76, who has been spending a lot of time in Hong Kong for Plantronics of Santa Cruz, Calif.; Bradford E. Hampson, '75, SM '77, now working for Harlequin, Inc., in Kendall Square (I inadvertently left Hampson off the Christmas card list in my previous article); Steven T. Kirsch, '78, SM '80, the founder of InfoSeek, which was recently mentioned in *Newsweek* for its low-cost, high-speed searches on the Internet; Paul A. Lawson, '70, of the Norton Co. in Troy, N.Y., with whom I reminisced about my office mate, the late Professor Karl Wildes, SM '22 (XVI-II), who was his faculty advisor; and Steven L. Rohall, '87, SM '88, whose e-mail note tells of his leaving Bellcore for TASC of Reading, Mass.—John A. Tucker, director (emeritus) and lecturer, VI-A Program, MIT, 77 Mass. Ave., Rm 38-473, Cambridge, MA 02139-4307; e-mail: <jat@fenchurch.mit.edu>.

## VII BIOLOGY

Joseph G. Fallon, MPH '44, writes that his retirements includes "travel, model sailing boats, photography, and consulting on environmental health problems." . . . Elizabeth V. Wattenberg, PhD '89 (Toxicology), reports: "I recently joined the faculty of the University of Minnesota as an assistant professor in the School of Public Health's Division of Environmental and Occupational Health. I teach and conduct research in the field of environmental and molecular toxicology."

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## VIII PHYSICS

Robert H. Price, '71, PhD '77, writes: "I am now VP and Science Fellow at JAYCOR. Connie and I have been married nearly 11 years and have five grandchildren. We recently took four of them to Disneyland. It's wonderful to watch their excitement with all the new things they see. We have a wonderful 3-year-old



**S**hirley Ann Jackson, '68, PhD '73, a professor of physics at Rutgers University, met with New Jersey Democratic Senators Bill Bradley (left), and Frank Lautenberg during Senate confirmation hearings on her nomination to the Nuclear Regulatory Commission. Jackson was confirmed without opposition and will head the agency that is responsible for overseeing the civilian use and disposal of nuclear materials in the United States. Jackson, the first African-American woman to obtain a doctorate from MIT, said her first priority at the NRC would be to make sure nuclear plants operate safely.

# INFORMATION SOUGHT

Science writer George Johnson is on contract with the *New York Times* to write a biography of physicist Murray Gell-Mann, PhD '51. Gell-Mann, most widely known for his discovery of the quark theory of matter, received the Nobel Prize in physics in



1969. Johnson would appreciate hearing from anyone with reminiscences, photographs, letters, or any other information. Please contact him at: 1147-1/2 Camino San Acacio, Santa Fe, NM 87501; (505) 989-4492; <johnson@nytimes.com> or <johnson@santafe.edu>.

Bischoff Frizea puppy, who is the most lovely and affectionate creature I have ever met. Connie is one of the most successful real estate agents in Santa Fe. We live in a beautiful house with views from the living room of more than 90 miles. I have recently become involved in interviewing students for the Hertz Foundation, which funded my graduate fellowship at MIT. The interviews are very rewarding for me."

Toyoichi Tanaka, professor of physics, was awarded the 1994 Inoue Prize for Science in Tokyo in February for his outstanding achievements in basic science. The award, established in 1984 to honor Setsuk Inoue, consists of \$20,000, a gold medal, and a citation. The citation praises Tanaka "for the discoveries of phase transitions and critical phenomena in gels and foundation of physics of gels." Tanaka is a world leader in the field of polymer gel physics. His research has encompassed the whole scope of this field and has led to a fundamental understanding of the phase transition, critical phenomena, kinetics, dynamics, and transport properties of polymer gels and the application of these principles in biology and engineering. Gels, which are jelly-like materials, are widely used in the chemical, medical, agricultural and food industries. In the late 1970s, Tanaka discovered that a gel can undergo reversible transition between swollen and collapsed phases. The principles governing this procedure led to understanding the molecular basis of polymer behaviors in general. Last year, Tanaka received the Vinci d'Excellence in France for his work. His other honors include The Award of the Polymer Society of Japan in 1986 and the Nishina Memorial Prize in 1985.

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## X CHEMICAL ENGINEERING

Great news and a tempting invitation from Robert Slifer, SM '50: "For the past 10 years, I have been the president, owner, and winemaker of Montelle Winery in Missouri's premier wine country. With a growth rate of 15

percent annually, the winery keeps me busy seven days a week. Anyone visiting St. Louis is welcome to visit us. We are only one hour away from downtown St. Louis or the airport." . . . Mary Spalding Burns, SM '79, attended law school while working as a chemical engineer at UOP in Mt. Prospect, Ill. She is now a partner with Rocky, Rifken, Ryther, a law firm specializing in patent and intellectual property law in Chicago.

News from William A. Klemm, ScD '46: "I have retired—fully this time—from the chemical engineering department at South Dakota School of Mines and Technology in Rapid City, S. Dak. Although I have emeritus status now, I still have time to talk with students and colleagues." . . . Keith M. Thompson, ScD '64, recently retired from the Pulp and Paper Research Institute of Canada and is looking into consulting prospects. . . . W. Mark Saltzman, SM '84, PhD '87 (Health Sciences and Technology), was promoted to the rank of professor in the Department of Chemical Engineering in the G.W.C. School of Engineering at The Johns Hopkins University. Saltzman, a Hopkins faculty member since 1987 who was promoted to associate professor in 1992, is internationally regarded as a leader in cellular and molecular engineering research. His research interests include polymers for controlled release, materials for tissue engineering, cell interactions with polymers and mechanisms of drug and cell migration in the body. An accomplished teacher, he was a 1990 winner of the Dreyfus Foundation Teacher-Scholar Award.

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### X-A PRACTICE SCHOOL

Robert Hanlon, SM '83, ScD '85, did me the honor of asking for some suggestions for a personal project on which he's embarked—an analysis of the sources, contributions, and outcomes of professional papers that are considered seminal in chemical engineering. For example, is what the author(s) originally emphasized the factor that has made the paper so long-lived and influential? When the work began, was the author seeking the understanding that has turned out to be so important?

And from answers to such questions, can one generalize on the role of serendipity—or just plain good luck—in scientific and engineering research? I made some comments that Bob was good enough to think might be useful—among them that *Technology Review* readers might have some useful responses and/or examples. Write to him at 119 Briarcliff Court, Glenn Mills, PA, 19342-2011.

Michael Abadi, SM '78, moved a year ago to Cheltenham, Pa., to work as business development manager for Ivax Industries. His job, in his own words: "mergers and acquisitions and director of the International Department for this specialty chemical company."

It's a busy summer for SCEP. Once again, as in 1994, the Practice School is operating a station at the U.S. Army Natick Research, Development, and Engineering Center, Natick, Mass., in addition to the regular-term stations at Dow/Dow Corning in Midland, Mich., and Merck in West Point, Pa. Both SCEP and the Natick RD&E Center were pleased with the results last summer, and this year's summer station is helping reduce SCEP's long waiting list. Colin Wolden, SM '92, PhD '95, is the director at Natick this summer.

Memorial services for A. Henry Schutte, SM '31, were held in the MIT Chapel on February 18, 1995; he died of cancer at Mount Auburn Hospital in Cambridge, Mass., on February 14. For four years after leaving MIT, Schutte was with the Standard Oil Co. in Sumatra; he then joined the Lummus Co., traveling throughout the world and, during World War II, developing synthetic rubber production in Port Arthur, Tex. He joined Arthur D. Little, Inc., Cambridge, Mass., in 1960 and retired in 1972, thereafter accepting occasional special assignments from ADL. A resident of Northboro, Mass., he was 88 at the time of his death.

Charles B. McCoy, SM '32, who—after a career with the company that spanned more than 50 years—is credited with "in many ways creating the modern DuPont," died in Wilmington, Del., last January 16 at age 85 of complications from Alzheimer's disease. McCoy joined DuPont upon graduating from MIT; his first assignment, as a cellophane operator, paid 32 cents an hour at a DuPont plant near Richmond, Va. In 1967, 35 years later, he was made president and CEO of the company and in 1971 became the first person in DuPont history to serve simultaneously as president and chairman. He relinquished those jobs in 1974 but continued on DuPont's board until 1987. A native of California, McCoy entered MIT from the University of Virginia, where he later served as a trustee. McCoy was for five years starting in 1973 a term member of the MIT Corporation, and he also served on the Harvard Business School Visiting Committee and the Rockefeller University Council. Chief among many honors and awards was the Chemical Industry Medal of the Society of the Chemical Industry. But the accolade that might have pleased him most came from a golfing colleague who described McCoy as an avid player with "a swing that made it look so easy."

Somewhat tardily, we learned this spring of the death on March 9, 1994, of Adolph L. Antonio, SM '37, ScD '39, in Arcadia, Calif., where he held important assignments with Aerojet General starting in the 1940s and ending with his retirement as group vice-president

in 1972. Antonio joined Aerojet General to work in solid rocket propulsion; later he became corporate director of the Minuteman Propulsion Program and in the 1960s was general manager of Aerojet's Space General subsidiary. In the 1950s, on leave from Aerojet, Antonio directed the Chemical Division of General Tire and Rubber Co., and in the 1980s, following his Aerojet retirement, he was owner (and president) of NION Pharmaceutical Corp. He was a fellow of ACS and AIAA, a member of the American Institute of Chemists, and holder of the American Rocket Society's Hickman Medal.

Send news to the undersigned by mail or fax (617 258-7264) at *Technology Review* or by e-mail in care of <grepo@mit.edu>.—John Mat-till, Room W59-200, MIT, Cambridge, MA 02139.

## XI URBAN STUDIES AND PLANNING

**Maria Remedios Ruiz, MCP '88**, of Santo Domingo in the Dominican Republic, sent a brochure about ALEPH (Agencia Latinoamericana de Expertos en Planificacion H, s.a.), the company she co-owns with Ignacio Harriague. ALEPH offers professional services in the implementation of capital investment and social projects in both the private and public sectors, sustainable institutional development, and participative strategic planning. Ruiz's work experience includes project formulation for expanding and improving health services, institutional analysis and design of sustainable strategies for non-governmental organizations, and organization of Caribbean conferences on architecture and urbanism. Contracting institutions include the United States Agency for International Development, the United

Nations Development Program, and assorted non-governmental organizations.

**Harvey Gantt, MCP '70**, was appointed member and chair of the National Capital Planning Commission. Gantt is an architect and principal in the firm of Gantt Huberman Architects. He has served five years on the North Carolina Board of Architecture and was a Fellow with the American Institute of Architects in 1987. Gantt has served two terms as mayor of Charlotte, N.C. He attended Clemson University where he was the first black student admitted to the university. The National Capital Planning Commission is the central planning agency for the federal government in the National Capitol Region. The commission reviews and approves federal construction proposals within the National Capital Region and evaluates the Federal Capital Improvements Program for the Office of Management and Budget.

**David Rubin, '65, MCP '66**, writes: "We moved from Maryland to New Jersey in 1993 when my wife, Sharon, became the VP for Academic Affairs at Ramapo College. I changed jobs shortly thereafter. I'm now planning manager for ICF Kaiser's New Jersey office and a daily commuter on the Garden State Thruway. All my current projects are domestic—a real change from the last two years of commuting to Shanghai. My older son, Ari, is now food and beverage manager at the Holiday Inn in Saginaw. My younger son, Josh, is a junior at the University of Chicago."

... Also from the Garden State, **Robert Breuer, MCP '62**, writes: "I am a consultant in transportation planning and engineering. I am currently working on a statewide, long-range plan for transportation in New Jersey."

**Susan Sklar, MCP '88**, writes: "I am the executive director of Southside Community Land Trust, an urban garden project in Providence, R.I. My partner, Rink Dickinson, MCP

# CourseNews

'86, and I had a baby girl, Savanna Dickinson Sklar, on September 16, 1994."

MIT Professor Emeritus **John T. Howard, MAR '35, MCP '36**, head of what is now the Department of Urban Studies and Planning from 1957 until 1970, died of a heart attack at his home in Newburyport, Mass., on February 2, 1995. After graduating from MIT in 1936, Howard traveled abroad on a fellowship. He then served as planning director for the city of Cleveland. In 1949, he returned to MIT as an associate professor. As a planner, Howard consulted widely. He was involved in redevelopment efforts in Baltimore, Boston, Hartford, Providence, Washington, Los Angeles, the San Francisco Bay area, and other smaller cities. He was a member and former president of the American Institute of Planners (AIP). Among his awards were the Distinguished Service Award of the AIP and the Yale Medal for Distinction in the Arts. After retiring, Howard was chairman of the planning board in Gloucester, Mass., and, at age 80, became a member of the planning board after moving to Newburyport.

The Association of Alumni and Alumnae was notified of the death of **Harold E. Langley, Jr., SM '55, ScD '57**, on August 18, 1994. No further information was provided.

Alumnae may send information for *Course News* to <mitalum@mitvmc.mit.edu>.

## XII EARTH, ATMOSPHERIC AND PLANETARY SCIENCES

**Jagadish Shukla, ScD '76**, writes: "I am now president of the Institute of Global Environment and Society in Calverton, Md., a non-profit research institute to study variability and predictability of climate." ... **Edward A. Boyle, PhD '76**, MIT professor of chemical oceanography, received the A.G. Huntsman Award from the Bedford Institute of Oceanography in Dartmouth, Nova Scotia. The award was established by the institute to recognize excellence of research and contribution to the marine sciences. Boyle was recognized for accomplishments including his study of oceanic distributions of trace elements in seawater, and he was cited as "one of the most productive and imaginative marine chemists to emerge over the past several decades." ... **Edward N. Lorenz, SM '43 (XIV), ScD '48 (XIX)**, professor emeritus in the Department of EAPS, was named the 1995 recipient of the American Meteorological Society's Louis J. Battan Author's Award. Lorenz was honored for his book, *The Essence of Chaos*. Lorenz has spent the majority of his career teaching, researching, and writing about atmospheric circulation, atmospheric predictability, and chaotic dynamical systems. ... Honors recently came to three geology professors in EAPS: Associate Professor **John Grotzinger** was elected a Fellow of the AAAS. Professor **Timothy Grove** was chosen by the Volcanology, Petrology, and Geochemistry Section of the American Geophysical Union for the 1994 Bowen Award. And Associate Professor **Maureen**



**Jinai Kim, SM '83, PhD '88**, was named one of *Time* magazine's *Global 100*, a roster of young leaders for the new millennium. Kim designed *Sanbon New Town*, a suburb of high-rise towers and two-story houses fanning gracefully up a valley 8 km south of Seoul. The next major project of her design company, *Seoul Forum*, is to revitalize parts of the seedy central Yongsan area of Seoul, currently the site of a U.S. military base.



# Injecting Science Into Fun

**Y**ou've raised your kids right: little MIT sweat-shirts, stuffed beavers, and now MIT baseball caps. But, on the cusp of junior high, they still don't care about Newton or have any idea why they should worry about his laws of motion. What's a parent to do?

Joan Roth, PhD '81, has the answer—one that allows loyal alums to keep working the MIT angle. Through her company, ScienceMedia of Newton, Mass., Roth has developed and is now marketing the SportsTech line of toys, which prominently displays an MIT seal of approval. The toys are aimed at 7-to-13-year-olds and consist of a package of tips that tell how to improve your performance in a particular sport, instructions for experiments that show why the tips work, and explanations of the science concepts illustrated by the experiments.

The basketball kit, for example, recommends putting backspin on the ball when making a shot. The young user then conducts an experiment: take a shot using no spin, then topspin, then backspin, each time observing what the ball does when it hits the rim or the backboard. A short, clear explanation—including the terms “force” and “momentum”—tells why the ball does what it does when it collides with a rigid surface.

Three members of MIT's faculty and research staff review each toy for science content and then pass it to a team of administrators who decide whether the toy warrants the MIT imprimatur. Roth believes that the MIT endorsement gives the SportsTech line a huge marketing edge. What's in it for the Institute? Roth will funnel a percentage of the profits from toys carrying the seal of approval to MIT's Council for Primary and Secondary Education,

which develops programs to improve K-12 education. Ronald Latanision, MIT professor of materials science and engineering and chair of the Council, believes that the MIT community and those it serves will also benefit because the toys will foster more interest in science and technology among kids and parents.

The MIT stamp isn't the only thing that sets ScienceMedia's products apart. Roth believes that other developers of educational toys try to inject fun into science; they assume an interest in the subject matter. The junior chem-

inkling of the wealth of knowledge these toys are designed to instill.

Roth is working from the other direction—trying to inject science into fun. The No. 1 interest of both boys and girls aged 7 to 13, according to focus groups conducted for ScienceMedia, is sports. “How many kids wake up in the morning and say, ‘I want to learn about prisms today,’ or, ‘Gee, Mom, I wonder how you split an atom?’” Roth asks. Not many. “They want to play baseball or jump on a trampoline.” Her goal is a simple one: encourage kids “to remember a few concepts. For example, if they only remember the words momentum and inertia, then when their science teacher lectures about these things, their ears will open up—the concept isn't a foreign animal. Out of a class of 25, instead of 6 kids interested in science, maybe there'll be 10 or 15.”

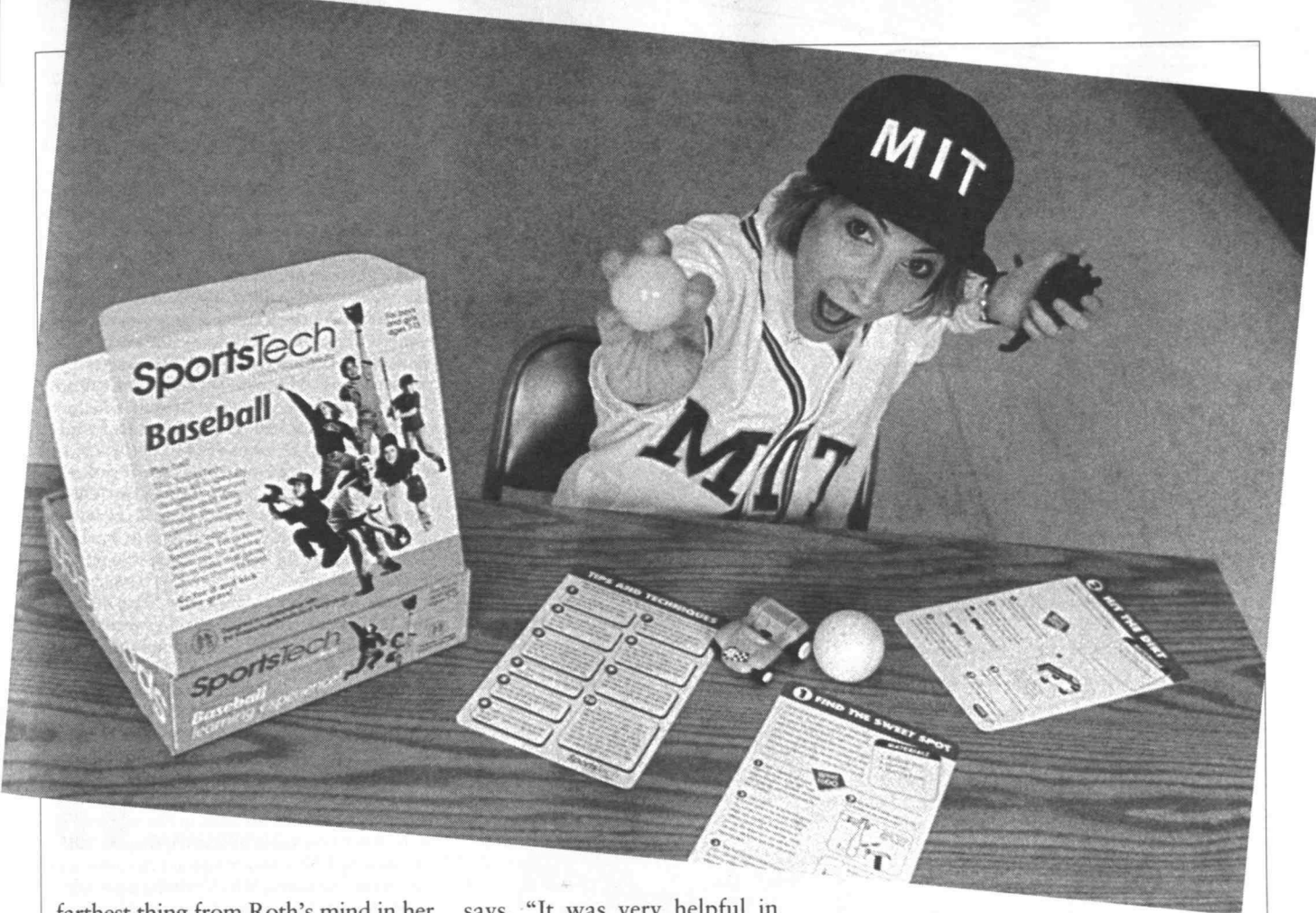
“You have  
to go where  
the people  
are: people  
are in front  
of their TVs,  
and the kids  
are playing  
with toys.”



istry set, for instance, lets kids make neat concoctions. But—except for the rare child who actually reads the manual instead of jumping to the next recipe—few kids gain even the smallest

**U**nlike most science toys, typically sold in museum shops or the new “brain stores” like LearningSmith, ScienceMedia products will also be available in toy warehouses and discount stores. The sports angle has convinced buyers for these stores that a wide variety of families—not just those with ties to MIT and other elite institutions—will find the toys attractive. Roth hopes soon to broaden the appeal of her products even further by launching a television series that's tied to the SportsTech line. Noting the recent spate of criticism of children's shows that push toys and other products, Roth says she's willing to take any flak that comes her way: “We're trying to reach as many people, both children and adults, as we can, to teach them the very basics of science. You have to go to where the people are: people are sitting in front of their TVs, and the kids are playing with toys.”

Becoming a toy developer was the



farthest thing from Roth's mind in her student days. She arrived at MIT with degrees in mathematics and political science from the University of Michigan and Brown, and in her first semester in the PhD program in urban planning she came across a widely used econometric model that attempted to predict fiscal strain in cities. The model struck her as flawed, and she spent most of her time at MIT picking away at it until she had developed a model that she thought was better. Her dissertation, *Why Cities Go Broke*, was published in 1982 while she was teaching in the UCLA Graduate School of Management.

"I was in the right place at the right time; suddenly Cleveland, New York, and Los Angeles were crumbling and my book was a hot topic," Roth says. UCLA nominated it for a Pulitzer Prize, and, as a result, Roth went on the lecture circuit. Local TV executives liked her speaking style and made her a regular on the KABC evening news—every Wednesday from 6:12 to 6:15, the news anchors would ask Roth questions about the economy. "I had to give 30-second soundbites to get across the same message I was giving in hour-long lectures at UCLA," she

says. "It was very helpful in terms of learning to speak to a different type of audience."

Roth might well have continued on that promising career path had not a serious car accident put her into the hospital for months. "I had been making mathematical models and teaching courses like budgeting and statistics," she says, "and suddenly I didn't have to do that." Given time to think, she realized that she wanted to do something more creative.

**A**fter she moved back to her native Detroit to marry Jonathan Roth, SM '89, he backed her purchase of a small house that she renovated and sold at a substantial profit. She was equally successful with a string of other houses, ultimately managing a block of 50 houses that she put on the market in 1988, before the recession took hold. "We sold out at a really high point," she says. "This was a great entrepreneurial experience." Returning to Boston when Jonathan became a Sloan Fellow for a year, Roth gave birth to a daughter, Caroline, and became a leader in the MIT Club of Boston.

It was the club's 1993 auction at the

*Joan Roth, a proselytizer for a good time with a science kick.*

Museum of Science, which she co-chaired with Jorge Rodriguez, '60, ScD '68, that gave Roth the idea for ScienceMedia. As part of the festivities, a group of faculty members dressed as history's greatest scientists and did a song-and-dance routine. The audience cracked up. For Roth—by then a mother "obsessed" with the topic of education, who cringed every time she read an article bemoaning Americans' pathetically low level of science literacy—that laughter was an epiphany. "My God," she said to herself, "we've got to relate to children in this fashion, and the way to do it is through television and toys."

Now Roth is looking for \$3 to \$5 million in venture capital to support both the manufacture and marketing of the toys and the production of the TV series. She's also looking for people and ideas. "If there are any MIT people out there who have toys they've made but have had no way to market them, we're interested." □

—LESLIE BRUNETTA

# Business Day

The New York Times

## The Top Draft Pick in Economics

A 24-Year-Old Star Coveted by Two Dozen Universities



# GRADUATE SCHOOL OF BUSINESS

Susan Athey on the campus of Stanford University, where she is completing her Ph.D. Ms. Athey, "a winnerwoman" by an adviser, was "the country."

**Susan Athey**

EDUCATION

Stanford University. Candidate for Ph.D. in

**S**usan Athey just completed a PhD in the economics program of the Stanford Graduate School of Business. She was courted, as the New York Times noted on the front page of its business section, by some two dozen universities—including Berkeley, Harvard, Princeton, and Yale. She chose to join the Department of Economics at MIT. Athey's thesis dealt with an improved method for analyzing risky business decisions, considered an important problem and one that had eluded some of the senior theorists in the field. Good news for MIT students: she is considered a superlative presenter—earning a standing ovation from Stanford MBA students after filling in as a lecturer, for example.

Raymo was named Joint Oceanographic Institutions/USSAC Distinguished Lecturer.

In other departmental news, Professor of Geology and Geophysics Leigh Royden, PhD '82, has been a corresponding member of the Scientific Council for Petroleum at the Croatian Academy of Sciences and Arts since 1987. . . . Principal Research Scientist Heidi Hammel, '82, has received further recognition for her work monitoring the collision of fragments from the comet Shoemaker-Levy 9 with the planet Jupiter last July. Provost Mark Wrighton selected her to receive a \$3,000 research allowance in honor of the late Vladimir Karapetoff, a distinguished scientist, electrical engineer, and musician. Funds for the award were contributed by his late wife, Rosalie M. (Cobb) Karapetoff, SM '23. . . .

Andrew C. Humphrey, a graduate student in meteorology, was the recipient of the American Geological Institute's minority geoscience scholarship for the 1994-95 academic year. . . . Jennifer Mills, an EAPS UROP student won the prestigious Orloff Prize award for outstanding undergraduate research on the Shoemaker-Levy Comet impact with Jupiter. . . . Edmund Chang joined the EAPS faculty as assistant professor effective in July 1994, and Robert van der Hilst, a seismologist from the Australian National University, will join the EAPS faculty effective July 1995. . . . Gordon H. Pettengill, '48 (VIII), professor of planetary physics and director of the Center for Space Research retired in February.

Alumni/ae may send information for Course News to <mitalum@mitvmc.mit.edu>.

## XIII

OCEAN ENGINEERING

Jerome H. Milgram, '61 (VI, XIII), SM '62, PhD '65, the William I. Koch Professor of Marine Technology, was one of six MIT faculty members elected to the National Academy of Engineering. Milgram was recognized for his design of sailing vessels and solutions to such ocean engineering issues as environmental impact and towing dynamics. . . . Ronald C. Gularte, OCE '72, a resident of Severna Park, Md., and engineer at the Office of Naval Research, has been named a Fellow of the American Society of Mechanical Engineers. . . . Paul Hagstrom, SM '75 (II), OCE '75, was appointed managing director of Transoceanic Cable Ship Co., Inc., an AT&T subsidiary. He recently retired as a captain from the U.S. Coast Guard where he had been both a master and chief engineer of large ocean-going ships. . . . Navy Lieutenant Commander David J. Kowalick, SM '91 (II, XIII), NE '91, recently reported for duty with Submarine Development Group One in San Diego. . . . Wendy Lawrence, SM '88, a Navy commander, made her first flight into space aboard the shuttle *Endeavor* in February on its longest mission to date. She was selected for astronaut training in 1992 following service in the Navy as a helicopter pilot. . . . Paul Erb, '76, SM '77 (II, XIII) reports: "I am hanging on against all odds in the oil business. After two years of layoffs, they nailed my boss and his boss, combined the jobs, and gave it to me. Guess who's next? I hope the severance package is good. I'm thinking of retraining as a charter captain. Here's to cold winters and higher gas prices."

Navy Ensign Katherine A. Trauth, '93, SM '94, recently completed the basic surface warfare officer's course. The course emphasized the duties of an underway officer of the deck, which includes shiphandling, maneuvering under simulated battle condition, radar detection, and tracking and plotting of enemy aircraft, ships, and missiles, among other studies.

The Association of Alumni and Alumnae was notified that Captain William A. Kerr, Jr., SM '67, NE '67, of Charleston, S.C., died on February 4, 1995 and Captain Henry P. Rumble, SM '38, of Ventura, Calif., died on January 25, 1995. No further information was available.

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## XIV

ECONOMICS

Michael Rothschild, PhD '69, dean of social science at the University of California/San Diego, will become dean of Princeton's Woodrow Wilson School effective July 1. Rothschild taught in Princeton's Department of Economics from 1972 to 1976. After receiving his PhD, he was named an assistant professor of economics at Harvard, a position he held until 1973. Appointed lecturer at Princeton in 1972, he was promoted to full professor in 1975. From 1976 to 1984, he was a professor of economics at the University of

Wisconsin, Madison. He went to San Diego in 1983 and assumed his present post in 1985. During his term as dean, UC/San Diego established new departments of cognitive science and ethnic studies within the division of social sciences, as well as its school of international affairs. As of last fall, social sciences had become the largest division at San Diego, in terms of permanent faculty. An economic theorist, Rothschild has written on a wide range of topics, including decision-making under uncertainty, investment, taxation, finance, and jury decision processes. He is known for analyses of the workings of markets with imperfect information, such as the market for medical care. His recent work has focused on the economics of higher education. He chairs a panel on estimation procedures for the National Research Council's Committee on National Needs for Biomedical and Behavioral Research Personnel. He is a Fellow of the American Academy of Arts and Science and the Econometric Society and has held a Guggenheim Fellowship (1978-79) and various research grants from the National Science Foundation.

... Charles E. Staley, PhD '56, writes: "I became professor emeritus in economics at the State University of New York at Stony Brook on June 1, 1994.

*Alumni may send information for Course News to <mitalum@mitvmc.mit.edu>.*

## XV MANAGEMENT

Richard G. Smith, SM '76, reports: "I was promoted to senior VP of Brambles USA, Inc., the U.S. holding company of an Australian multinational. Prior to this, I had been the CFO of the company's principal operating subsidiary." He can be reached via e-mail at <73532.1256@compuserve.com>.

F. Scott Leonard, '83 (II), SM '86 (II), SM '86, writes: "I joined Chevrolet in June 1990. I have been the program manager of the Geo Metro since November 1993. Since that time we have launched the new 1995 product in the marketplace. It was a great experience!" ... Cameron L. Smith, SM '65, reports: "I'm into my second year of information systems and business-process design consulting at a Mexican insurance company. The recent economic crisis has complicated the job, but it's still going along successfully."

Margaret L. Brandeau, '77 (XVIII), SM '78, writes: "My third son, Thomas, was born on August 31, 1994. I co-edited *Modeling the Aids Epidemic: Planning, Policy, and Prediction* (Raven Press, 1994), a book that describes how mathematical models can be used for analysis of the AIDS epidemic and interventions proposed to curb the epidemic." She can be reached via e-mail at <margaret.brandeau@forsythe.stanford.edu>.

News from John R. Chisholm, '84 (XVI), SM '87: "My wife, Jennifer, and I had our first child, Jonathan Isaac, on June 20, 1994. He has been a real joy to us. My company, Acadian Asset Management, has been doing well. I've been to New Zealand and Australia often. I was visiting the Singapore trading floor of Barings the week before they collapsed. I promise I had nothing to do with it!" ... Karen Patkin, SM '91, and Bruce

Rosner, SM '92, of New York City, are engaged. Patkin writes: "We plan to be married in Massachusetts. I am currently working at Bankers Trust in capital markets and Bruce is a senior marketing manager at American Express."

A change of address card from Harel Beit-On, SM '85, and his wife, Tamar, reads: "We are updating you from our new home in Israel. Returning home after 12 years is a challenge by itself but things are going well and everybody seems to be happy. We have received the postcard regarding the upcoming reunion weekend and are looking forward to receiving further details so that we can plan our trip back to our 'first home' outside of Israel 12 years ago."

Max C. Coutts, '39, writes, "The president of MIT has been sending us excellent letters—very interesting information and reflecting wonderful vision. The challenges are so daunting these days. I feel very thankful for my MIT experiences. They're close to the top in my life. All the best to everyone."

Via e-mail, Larry Kooper, SM '88, writes: "I've just taken a job as director of consulting services at Bennet-Tec Information Systems on Long Island. We develop software for Windows, including Visual Basic custom controls. The company is headed by Jeff Bennett, SM '86. You can reach me on the Internet at <larryk@i-2000.com>."

The Association of Alumni and Alumnae has learned that Noorna S. Sarofim, SM '72, of New York City, died on February 15, 1995. No further details were available.

Robert B. Lorick, SM '79, of Blacklick, Ohio, died of lung cancer on January 2, 1995.

*Alumni may send information for Course News to <mitalum@mitvmc.mit.edu>.*

### SLOAN FELLOWS

Robert T. Wallace, SM '53, died on December 29, 1994. He had suffered from lung cancer. Wallace joined Owens-Illinois in Toledo, Ohio, as chief of plastic development in 1954. In 1958, he was promoted to assistant research director in charge of applied research organics, and was a member of Princeton University's plastics advisory council. He was assigned to the firm's international division as VP of the Panamanian subsidiary in 1959. He was director of new product planning from 1964 to 1966, when he was named VP of new product planning and development. During Wallace's 21 year career at Owens-Illinois, he also served as VP and director of the National Petro Chemical Corp. Before joining Owens-Illinois, he had worked at Libbey-Owens-Ford and the Carbide & Carbon Chemical Corp. A registered professional engineer, Wallace held six patents and was selected Toledo's Engineer of the Year in 1965. Wallace was the first customer of the Dayton Electric Corp. in 1979 when he purchased a Electric Leopard, a 1980 deluxe model Renault Le Car, which had an 18-horsepower electric motor. Among Wallace's many professional affiliations, he was on the board of directors of the Toledo Salvation Army and chairman of the advisory council for Polymeric Materials Program at Princeton University's School of Engineering.

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## SENIOR EXECUTIVES

The Association of Alumni and Alumnae was notified that **Max P. Watson**, '63, died on April 6, 1994. No further details were provided.

## MANAGEMENT OF TECHNOLOGY



**Robert L. Capell**

**Robert L. Capell**, SM '88, has been promoted to VP for strategic management at BellSouth Telecommunications and elected an officer of the company. . . . **Geoffrey Gill**, SM '89, and his wife, Laurie Hall, announce the birth of their first son, Joseph Gill, born on February 15, 1995. . . . **Hiro Yamazaki**,

SM '89, wrote to tell us that he has taken a new position as head of Nippon Zeon R&D Center in Japan. . . . **Thomas Heller**, SM '91, and his wife, Ann, announce the birth of their first daughter, Kimberly Jayne Heller, on November 3, 1994. . . . **Audie Hittle**, SM '91, has been selected for promotion to USAF major, and is the chief of the Electronic Systems Center (ESC) at Hanscom Air Force Base's Technology Transfer Branch. He now manages all cooperative R&D activities initiated between ESC and industry and/or academia. . . . **Steven Siegel**, SM '91, has left

IBM to join COMPAQ Computer Corp. as product test manager. He and his wife, Leslie, have relocated to Houston, Tex., and are expecting their first child in May 1995. . . . **David Wright**, SM '91, is now the managing director at HE Microwave in Tucson, Ariz. HE Microwave, a joint venture between Delco Electronics and Hughes Aircraft, is involved in the design and manufacturing of low-cost, high-volume radar modules for automotive, commercial, and defense markets. . . . **Paolo Radaelli**, SM '94, is now working as R&D planning manager assistant at Enichem, S.P.A., in Milan. He is responsible for R&D projects, economic evaluations, technical reports control, and assisting in the preparation of the four-year R&D plan for Enichem.—Send news via e-mail at <mitmot@sloan.mit.edu> or write to Management of Technology Program, MIT, 50 Memorial Drive, Suite E52-126, Cambridge, MA 02142.

## XVI AERONAUTICS AND ASTRONAUTICS

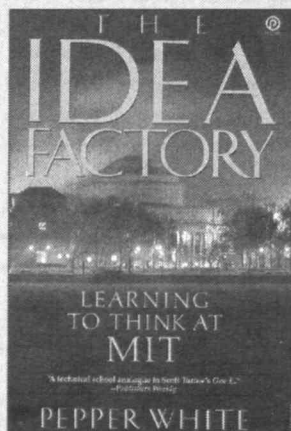
**Douglas C. Finch**, '82, SM '84, announces the birth of his daughter, Cameron Clark Finch, on October 6, 1994. . . . **Howard R. Krauss**, MD, SM '72, reports: "I am the medical director of Southern California Neuro-Ophthalmology and Orbital Surgical Associates and assistant clinical professor in the UCLA departments of ophthalmology and neurosurgery. I am currently president of the UCLA Department of Ophthalmology Association,

an associate examiner of the American Board of Ophthalmology, a member of the board of directors of the California Association of Ophthalmology, and a recent honor award recipient of the American Academy of Ophthalmology. I reside in Brentwood with my wife Cheryl, who is an educational psychologist with the Los Angeles Unified School District, and our children, Josh, Stephanie, and Lauren." . . . Congratulations to a Course XVI faculty member: **Edward M. Greitzer**, the H. Nelson Slater Professor of Aeronautics & Astronautics and director of the Gas Turbine Laboratory, was one of six MIT faculty members elected to the National Academy of Engineering this year. Greitzer was selected for his contributions to aircraft gas-turbine compressor aerodynamics and leadership of the MIT Gas Turbine Laboratory. .

**Geoffrey K. Bentley**, '58, SM '60, received the 1995 Aerospace Contribution to Society Award from the American Institute of Aeronautics and Astronautics. The award recognizes a notable contribution to society through the application of aerospace technology to society. Bentley is currently the manager of business research for Textron Defense Systems. His extensive experience in the American aerospace community includes assignments in marketing, business management, project management, and technical support. During his 30-year career, he has authored scores of technical studies and public policy articles in numerous American aerospace publications.

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# XVII

## POLITICAL SCIENCE

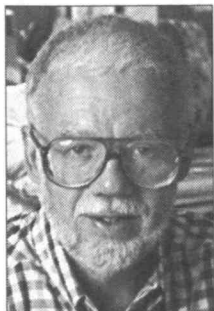
Via e-mail, John R. Mathiason, PhD '67, writes: "It being the 50th anniversary of the United Nations, it might be worthwhile remembering some of the MIT Course XVII alumni who serve[d] in that august body. In many ways, our mentor was Norman Padelford, who was involved in the negotiations of the United Nations Charter and who, against considerable odds, believed in the organization. I am one of the lesser mortals. After receiving my doctorate and partially conducting my thesis research in the employ of the United Nations, I joined the United Nations Secretariat in 1971, where I have remained since. I am currently deputy director of the Division for the Advancement of Women in the Department for Policy Coordination and Sustainable Development. We are preparing for the Fourth World Conference on Women, which will be held in Beijing in September 1995. One of my prides is the production of a study entitled "Women in the Changing Global Economy," which was just issued as a sales publication by the United Nations. In my spare time, I am an adjunct professor at New York University's Wagner School of Public Service, where I teach two courses on the United Nations: Managing the World and Delivering Global Services. Both are about the emergence of the United Nations as a significant public administration in the late 20th century. But my work pales in comparison to another MIT grad, James Jonah, PhD '67, who rose to the rank of undersecretary-general for Special Political Affairs."

The MIT Washington Summer Internship Program has announced its inaugural class of 10 undergraduate interns in Science and American Politics. The students, who represent all five MIT schools, will bring their formidable technological expertise to Capitol Hill this summer to work in fields where technical issues overlap with public policy and politics.

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# XVIII

## MATHEMATICS



Alfred Clark

Professor Alfred Clark, Jr., PhD '63, of the University of Rochester Department of Mechanical Engineering, was selected a winner in the 1994 Carnegie Foundation for the Advancement of Teaching U.S. Professors of the Year Program. To relate theory to life experiences, Clark takes his students to ride

roller coasters, where they calculate acceleration. He is particularly committed to curbing attrition in mathematics courses and works to teach a more applied form of math to developing engineers. Clark's advice to other profes-

sors who desire to be outstanding teachers: Be organized, be kind, get to know your students, and put some fun into your teaching.

Samuel A. Elias, PhD '74, writes: "I was just appointed the neurological director of the pallidotomy project at University Hospital. I am responsible for the selection and evaluation of patients having pallidotomy performed for Parkinson's disease. Last year, I was named director of the Carol M. Turnbull Laboratory for the study of Motor Control and Tremor at University Hospital, where I am a clinical specialist in movement disorders. I am an assistant professor at Boston University Medical Center. After receiving my doctorate, I was a Kaplun Fellow of Applied Mathematics at Caltech. I received an MD from University of Pennsylvania Medical School in 1980, and completed a neurological residency at Massachusetts General Hospital (MGH) in 1984. From 1984 to 1989, I was a visiting scientist in brain and cognitive science at MIT in the laboratory of Emilio Bizzi. While I was a neurologist at MGH, I received the National Institute of Health Teacher Investigator Award. I currently live with my wife and two daughters, Evelyn (11) and Katie (16), in Weston, Mass."

The Association of Alumni and Alumnae has learned that Arthur Benjamin Clymer, SM '48, of Hessel, Mich., died on July 20, 1994. No further details were provided.

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# XXII

## NUCLEAR ENGINEERING

Neil E. Todreas, Korea Electric Power Corp. (KEPCO) Professor of Nuclear Engineering, received the 1994 technical achievement award from the American Nuclear Society's Thermal Hydraulics Division. Todreas was cited for outstanding technical accomplishments in nuclear reactor thermal hydraulic design and safety analysis, ranging from characterization of the energy exchange processes within reactor fuel assemblies to origination of innovative reactor design concepts. His role as a leading educator in nuclear engineering and as a participant on major nuclear energy advisory panels were also noted.

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# XXIV

## LINGUISTICS AND PHILOSOPHY

Edward B. Turk, professor of French and film studies in the foreign languages and literature section, has been awarded the 1995 Levitan Prize in the Humanities. The \$20,000 prize, first awarded in 1990, was established through a gift from James A. Levitan, '45 (X), who is a Corporation member and senior partner of a New York law firm. The prize supports creative and innovative scholarship in the humanities by faculty in the School of Humanities and Social Science. Turk will use the money to continue his research for a book, *Jeannette MacDonald and the Decline of the Middlebrow in Twentieth-Century America*.

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# GAZETTE

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**Tapio Kuusinen**, '79 (I), SM '79, is group leader for environmentally sustainable processing at Battelle Northwest in Richland, Wash. His daughter, Christine, is in kindergarten and his wife, Eva, is setting up an antique shop. Golfing and camping are in the works for the coming year. . . . **Jeffrey Bailey**, SM '81, ScD '88 (II) is employed at Exxon in Houston and has three children, Betsy, Lucy, and George.

**Jean-Bernard Caen**, SM '81, writes that he started a consulting firm, Finance and Technology Management, four years ago to help banks manage their risks. He writes: "It is astonishing how far European banking management often is from economically driven aptitudes. This may result from a tightly regulated environment that was in effect up until lately. The outcome is an incredible thirst for basic understanding of capital management and shareholder behaviors. Moreover, capital and risk are closely related and risk is a hot topic. All this gives us a lot of work. The nice thing is that U.S. banks are far ahead in this prospect and they are willing to help to stabilize the market." . . .

**Robert Chen**, '76 (XII), SM '82 (TPP, XIX), has been putting his TPP training to good use as project scientist for the Socioeconomic Data and Applications Center, one of the NASA Earth Observing System Data Centers. Chen's wife, Meredith, now works half-time on environmental health issues. Bryce just turned 7 and enjoys second grade; Kathryn is nearly 2.

In June 1994, **David Cheney**, SM '83, joined the Clinton Administration as a consultant in the Office of the Undersecretary in the Department of Energy. There was an addition to the Cheney family in July 1994. Daughter Austin Elizabeth joined brother Alex and parents David and Alexandra. Best wishes to the Cheney family! . . . **Kent Hughes**, SM '85, is currently working at Air-Touch Communications, a cellular/wireless telecommunications company. His current assignment is in the Advanced Technology Group developing advanced cellular subscriber features. Hughes says both the work and the company are great. A second child, Amanda Joan Hughes, arrived last May and is doing well.

**Philip Ng**, SM '85, MCP '85 (XI), appeared in a *Worldlink* article featuring Global Leaders for Tomorrow. He holds a number of senior company positions: chairman, Orchard Parade Holdings; director, CEO, and project consultant, Sino Group. Ng facilitated a recent joint venture between Orchard Parade Holdings and Wywy (video games arcades, American restaurant franchises, and high-tech theme parks). The deal should take the sprawling empire into telecommunications and the video and multimedia game business. Other plans include looking for wider property markets in China and Pakistan, and, through OPH, exploring new business areas. . . . During the past year, **Major Gregg Martin**, SM '88 (I, TPP), PhD '92 (I), served as the operations officer and, later, as the executive officer of the U.S. Army's 864th Engineer Combat Battalion at

Fort Lewis, Wash. He was involved in construction operations in Paraguay, Honduras, and Thailand, and also fought forest fires in Idaho. . . . **Erin Craig**, SM '89, is the director of a program at the University of California that provides free environmental compliance assistance to businesses. . . . **Nibras El Fadel**, SM '89, is working in France as the director of Arthur Andersen Informatique. . . . **Michael Nussbaum**, SM '90, is fixing up an old falling-down house in Newton, Mass. with the help of his wife, Jill, and daughters, Kayla, 4, and Hannah, 2.

**Kristin Wulfsberg**, SM '90, informed us that this past year was like riding on a roller coaster. She began a completely new line of work as the office manager of a software company that produces e-mail management utilities. Her interests include Chinese medicine, yoga, and other Eastern methods of exploration. . . . During 1994, **Usman Ghani**, SM '91(XV,TPP), successfully managed several important projects, including an advanced consulting skills workshop for a global telecommunications company; a marketing program for a global information company; an integrated competency development program for a large airline; intensive executive education sessions for a leading telecommunications firm in Far East Asia; and three extensive reengineering projects. Ghani informs us that the various programs he pursued at MIT figure prominently in his work. . . . **Seabron Adamson**, SM '92 (I,TPP), has been traveling recently to Uzbekistan in Central Asia. He is working with the Ministry of Energy there to develop a reasonable energy policy for the country, which has only been independent for three years. Although Uzbekistan has considerable gas reserves, export potential is limited through the existing Russian and Kazakh pipelines to Europe.

**Eugene Bae**, SM '93, is returning to MIT in September 1995 to pursue a PhD in nuclear engineering. . . . **Bruce Jacobson**, SM '93, is currently working for SNET Multi-Media Services on a video dial-tone project as the manager for technical planning. . . . **Jim Rymarsuk**, SM '93 (TPP,XVI), has been selected as a White House Fellows semi-finalist. . . . **Chris Houlahan**, SM '94, and her husband, Bart, had a daughter, Carly, on June 26, 1994. . . . **Mike Telson**, '67 (VI), SM '69 (VI), EE '70 (VI), PhD '73 (VI), SM '74 (XV) and TPP Friend, has now moved from the congressional staff to the Office of the Secretary at the Department of Energy.

## PROGRAM IN SCIENCE, TECHNOLOGY, & SOCIETY

MIT Associate Professor of Engineering and Technology Studies **Larry Bucciarelli**, PhD '66 (XVI), delivered "Engineering Design and Product Development: An Ethnographic Perspective" at the Seminar on the Management of Innovation in Ramouillet, France. . . . Professor of Science, Technology, and National Security Policy **Theodore Postol**, '67 (VIII), SM '72 (XXII), PhD '76 (XXII) was awarded the 1995 Hilliard Roderick Prize in Science, Arms Control, and International Security by the American Association for the Advancement of Science. . . . MIT Professor of Political Science **Eugene Skolnikoff**, '49 (VI), SM '50 (VI), PhD '65 (XVII), delivered the keynote address at the 75th Anniversary of the Royal

Swedish Academy of Engineering in Stockholm in October 1994. He is participating in a Columbia University conference series examining *Science the Endless Frontier* by **Vannevar Bush**, EGD '16. This series explores possible replacements for the government/science relationships that have developed since World War II. . . . **Wade Roush**, PhD '94, joined the news staff of *Science* magazine in January 1995. Roush will remain in Boston as the magazine's New England correspondent. His articles on the United Nations population conference in Cairo and the aftermath of the shut-down of the Superconducting Super Collider appeared in the August 26th and October 28th issues of *Science*, respectively.—**Graham Ramsay**, STS Program, MIT, Room E51-128, Cambridge, MA 02139

## Deceased

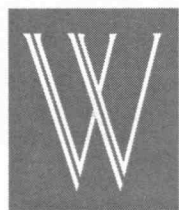
The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

**Enos Wettlaufer Curtin**, '17; December 7, 1994  
**William W.K. Freeman**, '22; January 19, 1995; Gladwyne, Pa.  
**Roger O. Ingalls**, '22; February 12, 1995; Jamesburg, N.J.  
**Eugene V.B. Van Pelt, Jr.**, '22; January 30, 1995; Lancaster, Va.  
**William Edgar Appleton**, '23, SM '24; July 12, 1994; Tampa, Fla.  
**William Littleton Barclay**, '23; January 24, 1994; Rye Brook, N.Y.  
**Robert O. Dehlendorf**, '24; January 31, 1995; Menlo Park, Calif.  
**William Leonard Rowe**, '24; February 13, 1993; Sarasota, Fla.  
**William Edward May**, '25; August 6, 1975  
**Charles Wesley Meytrott**, '27; January 31, 1995; Brooklyn, N.Y.  
**John W. Norris**, '27; December 20, 1994; Marshalltown, Iowa  
**Donald McClelland Sturznick**, '28, SM '29, ScD '32; February 14, 1995; Whiting, N.J.  
**Peter John Zugale**, '28, SM '29; January 20, 1995; Jamesburg, N.J.  
**Adolph C. Hugin**, '30; December 20, 1994; N. Springfield, Va.  
**Granger Dana Schrader**, '30, SM '31; February 27, 1995; Havertown, Pa.  
**Maurice Thurber Ayers**, '31; February 5, 1995; Long Valley, N.J.  
**Emilio G. Collado**, '31; February 9, 1995; Palm Beach Gardens, Fla.  
**Marvin Plimpton Egleston**, '31; June 6, 1993; Salt Lake City, Utah  
**Darius William Gaskins**, '31; November 9, 1994; Tuscaloosa, Ala.  
**August Henry Schutte**, SM '31; February 14, 1995; Lexington, Mass.  
**Robert Arthur Hinners**, SM '32; November 29, 1994; Damascus, Md.  
**Charles B. McCoy**, SM '32; January 16, 1995; Wilmington, Del.  
**Mary Baker McNair Scott**, '32; February 9, 1995; Philadelphia, Pa.  
**John Edward Bell**, SM '36; December 20, 1994; Cape Coral, Fla.  
**Margaret B. Geddes**, '33; February 18, 1995; Providence, R.I.  
**Francis O. Merchant**, '33; December 31, 1994; Long Beach, Calif.  
**Edward S. Rowell**, '33; February 15, 1995; Sherborn, Mass.

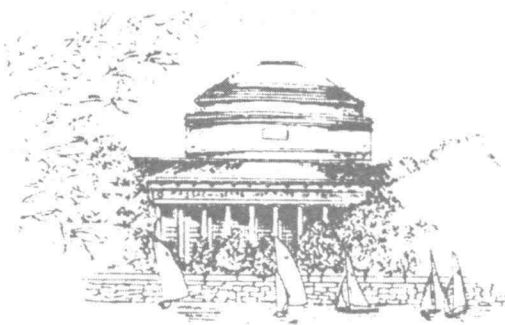
George V. Sweetnam, '33; November 18, 1994; Bradenton, Fla.  
 Cassius Clarke Belden, '34; August 19, 1992; Brockville, Ont.  
 Frederick Eugene Perry, '34; October 6, 1994; Reading, Mass.  
 Reid Ewing, '35, SM '36; February 2, 1995; Winter Park, Fla.  
 Copeland Charles MacAllister, '35; December 31, 1994  
 Vinton Kenneth Ulrich, '35; January 16, 1995; Damascus, Md.  
 Thomas Kato, '37; August 13, 1993; Tokyo, Japan  
 George Dudley Mylchreest, '36; March 1, 1995; Simsbury, Conn.  
 William B. Burnet, '37; February 25, 1995; Minneapolis, Minn.  
 Donald Stuart Duncan, '37; December 31, 1994; Manchester Center, Vt.  
 James Francis Stroker, SM '37; May 8, 1993; Humble, Tex.  
 John Francis Glacken, '38; January 12, 1995; East Falmouth, Mass.  
 Eric William Thrift, MAR '38; February 12, 1995; Kingston, Ontario, Canada  
 Otis John Earl, SM '40; January 8, 1995; Heathsville, Va.  
 Irving Weil Isaacs, MAR '40; March 8, 1995; Newtown, Pa.  
 William L. Sweet III, '40; November 3, 1994; Fort Wayne, Ind.  
 Johan Marinus Andersen, '41; February 2, 1995; St. George, Grenada, West Indies  
 Arthur Amos Fletcher, '41; July 14, 1994; Lexington Park, Md.  
 John Lindstrom, MAR '41; March 14, 1995;

Fountain Hills, Ariz.  
 Dwight F. Mowery, PhD '41; December 19, 1994; Oldsmar, Fla.  
 Donald H. Stansfield, '42, MCP '48; February 16, 1995; Marlborough, Conn.  
 Robert George Vyverberg, '42; February 22, 1995; Pittsford, N.Y.  
 Robert E. Hewes, '43; February 14, 1995; St. Petersburg, Fla.  
 Edward Joseph Dolezel, SM '44, ScD '48; October 6, 1994; Belmont, Mass.  
 Joseph Julien Snyder, '44; February 28, 1995; Manchester, Mass.  
 Stanley William Warshaw, '44, SM '47; December 20, 1994; Sarasota, Fla.  
 Peter Sluis, '46; January 2, 1994; Wyckoff, N.J.  
 Lawrence Jerome Levine, SM '47; October 9, 1994; Valley Stream, N.Y.  
 Edmund Underwood Ritter, '47; January 8, 1995; Chestnut Hill, Mass.  
 James Allison Bierlein, '49; November 12, 1993; Kettering, Ohio  
 Warren Ellsworth Duerr, SM '49; October 19, 1994; Rochester, N.Y.  
 Herbert Edward Miller, '50, SM '50; January 28, 1995; Brookline, Mass.  
 Elmer Nielsen, PhD '50; June 9, 1993; El Cerrito, Calif.  
 Allen B. Thompson, SM '50; November 7, 1994; Dallas, Tex.  
 William Hubert Ramsey, '51; January 14, 1995; Newton, Mass.  
 Ernest K. Warburton, '51; May 9, 1994; Port Jefferson, N.Y.  
 Thomas Kenneth Cauley, '52; December 15, 1994; Bloomfield Hills, Mich.  
 Carl Frederick Franz, SM '52; July 17, 1994;

Indianapolis, Ind.  
 Charles T. Hathaway, PhD '53; January 30, 1995; Covina, Calif.  
 Stuart MacPhee Kleinfelter, '53; March 3, 1995; Grantham, N.H.  
 Robert T. Wallace, SM '53; December 29, 1994; Rockford, Ill.  
 Richard Sears Foster, '54, SM '55; January 27, 1995; West Chatham, Mass.  
 Carl Anthony Odening, '54; February 27, 1995; Wallingford, Pa.  
 Harold E. Langley, Jr., SM '55, ScD '57; August 18, 1994; Durham, N.H.  
 Leo Frederick Hood, '57; November 15, 1993; West Lawn, Pa.  
 Carl Robert Gloskey, SM '59; February 7, 1995; Hilton Head, S.C.  
 Arnold Bersofsky, '60; January 17, 1995; Potomac, Md.  
 Harold Reed Gregg, '63; April 13, 1993; Sonoma, Calif.  
 Paul Abelardo Heinen, SM '63; February 26, 1995; Lake Forest, Ill.  
 Max P. Watson, '63; April 6, 1994; Houston, Tex.  
 William A. Kerr, Jr., SM '67, NE '67; February 4, 1995; Charleston, S.C.  
 Leroy Charles Pusey, '70, SM '72, EE '72, ScD '75; October 31, 1994; West Hills, Calif.  
 Siegfried Mathias, '71, SM '72; August 14, 1994; Littleton, Mass.  
 Robert Allen Deich, '71; December 26, 1994; Rochester, N.Y.  
 Noorna S. Sarofim, SM '72; February 15, 1995; New York, N.Y.  
 Judith Helen Carey, SM '79; May 5, 1994; Quincy, Mass.  
 Robert B. Lorick, SM '79; January 2, 1995



## HERE MIGHT A NAME BEST LIVE?



The name of a deceased MIT alumna or alumnus can be linked to the Institute through gifts made by classmates, colleagues and family. Memorial gifts can be unrestricted or directed toward scholarships, research or any program of the Institute. The Institute notifies bereaved families of the name of each donor, and each gift becomes a part of MIT's permanent record.

Named endowed funds whose income supports the work of the Institute in perpetuity can be established with larger gifts. If you would like information on ways of expressing sympathy through a memorial contribution, or on establishing a named endowment fund, please contact Betsy Millard, MIT Room E38-202, Cambridge, MA 02139 or call (617) 253-8059.

# PuzzleCorner

It has been a year since I reviewed the criteria used to select solutions for publication. Let me do so now. As responses to problems arrive, they are simply put together in neat piles, with no regard to their date of arrival or postmark. When it is time for me to write the column in which solutions are to appear, I first weed out erroneous and illegible responses. For difficult problems, this may be enough; the most publishable solution becomes obvious. Usually, however, many responses still remain. I next try to select a solution that supplies an appropriate amount of detail and that includes a minimal number of characters that are hard to set in type. A particularly elegant solution is, of course, preferred as are contributions from correspondents whose solutions have not previously appeared. I also favor solutions that are neatly written, typed, or sent via e-mail, since these produce fewer typesetting errors.

## Problems

**Jul 1.** John Rudy wants to know how South is to make seven spades after West leads the diamond king.

		North	
		♠	A K Q J
		♥	A x x
		♦	
		♣	Q J 10 9 8 7
West		East	
♠		♠	
♥		♥	
♦		♦	
♣		♣	
		South	
		♠	10 9 x x x
		♥	
		♦	A x x x x x
		♣	A K

**Jul 2.** Chris Svenasgaard wants you to figure out who played whom and what



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB  
NEW YORK UNIVERSITY  
715 BROADWAY, 10TH FLOOR  
NEW YORK, N.Y. 10012,  
OR TO: GOTTLIEB@NYU.EDU

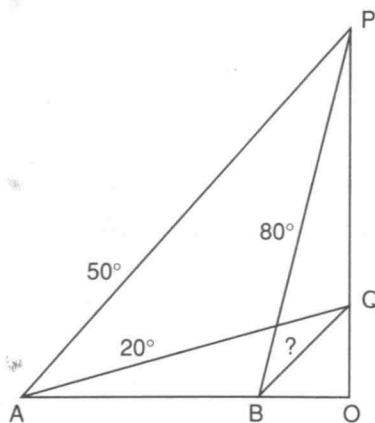
the scores were in each game. Note that all games are intragroup and that (W, T, L, F, A, P) = (Wins, Ties, Losses, goals For, goals Against, 2W+T).

GROUP A						
TEAM	W	T	L	F	A	P
Sampdoria	1	1	0	2	0	3
Panathinaikos	0	2	0	0	0	2
Red Star	1	0	1	3	4	2
Anderlecht	0	1	1	2	3	1

GROUP B						
TEAM	W	T	L	F	A	P
Barcelona	1	1	0	3	2	3
Sparta Prague	1	0	1	4	4	2
Dynamo Kiev	1	0	1	2	2	2
Benfica	0	1	1	0	1	1

**Jul 3.** Gordon Stallings, after spending countless hours studying flagpoles, asks the following:

Flagpole OP has a band of paint part way up at Q. Observer A sees the top of the pole, P, at an angle of 50 degrees, and the band at an angle of 20 degrees. Observer B sees the top at an angle of 80 degrees. At what angle does B see the band?



## Speed Department

Speedy Jim Landau notes that ASCAP has employees who monitor radio and TV for copyrighted songs so that royalties can be properly assigned. Why do these monitors need to know precalculus?

## Solutions

**F/M 1.** Larry Kells offers a sequel to his N/D 1 bridge problem, where 7NT was unbeatable despite one defender having 26 points.

On a later date, in another high-stakes game, I saw the same couple defend unsuccessfully against another 7NT, redoubled and vulnerable. This time in the aftermath they argued as follows:

*Husband:* That was really fine of you, the way you kept criticizing me for doubling 7NT when I didn't have all four suits stopped. You just did the same thing!

*Wife:* But I had THIRTY points! I knew we had to be able to beat 7NT. And we would have if you had led any card other than the one you did. They would have been down TEN!! But you had to lead the one card that let them make it!

*Husband:* But how could I have known, when that suit was never bid?

*Wife:* You should have known that if you had led one of the other suits, and it turned out badly, at least they couldn't have run so many tricks in it!

Assuming they were telling the truth, reconstruct the deal.

		North	
		♠	10 9 8 7
		♥	10 9 8 7
		♦	A 10 9 4 3
		♣	
		West	East
♠	5 4 3 2	♠	A K Q J
♥	5 4 3 2	♥	A K Q J
♦	8 7 6 5	♦	K Q J
♣	10	♣	K J
		South	
		♠	6
		♥	6
		♦	2
		♣	A Q 9 8 7 6 5 4 3 2
East	South	West	North
2S	Pass	2NT	Pass
3H	Pass	3S	Pass
6S	Pass	Pass	7D
DBL	RDBL	Pass	Pass
Pass			

North's 7D is a sacrifice and South figures that 7NT is no worse than 7D. The redouble is an attempt to bluff West out of leading a major suit.

With an opening lead of the 10 of clubs, South captures the king with the ace and then runs the clubs, discarding all dummy's spades and hearts and two small diamonds. If East kept one spade, one heart, and one diamond, declarer now leads to the diamond ace and dummy is high. If East kept two diamonds and a spade or heart, South now plays the good suit.

*Continued on Page MIT 30*



# MIT LIFE INCOME FUNDS

## MR. AND MRS. NEWLAND F. SMITH

HOME: Hanover, New Hampshire

CAREER: Newland Smith's ('33 EE, S.M. '34) career in the development of television broadcasting equipment and networks began with his graduate work on cathode ray tubes with Truman S. Gray, who was then a research assistant in electrical engineering at MIT. Mr. Smith held positions with Philco, RCA and WOR in New York, and with Gray Research and Development in Hartford, where he rose to the position of president. In 1962, he and a partner developed a mobile computerized retrieval system for stolen car data. After IBM acquired their patents, Smith became assistant president at Visual Electronics Corporation in New York and then a senior engineering consultant at CBS-TV. He retired in 1974.

Mr. and Mrs. Smith met playing tennis in Heath, Massachusetts, where Mr. Smith's father had a summer home. The Smiths later made this home their year-round residence; but when they moved into the Hanover Retirement Community, they gave the home to MIT. Now Mr. Smith serves as a computer consultant, giving help and instruction to fellow residents. He and Mrs. Smith still play tennis and enjoy mountain climbing.

MIT LIFE INCOME FUND:  
Newland F. Smith, Jr., and Caroline C. Smith Gift Annuity.

QUOTE: My MIT training was invaluable in helping me find a position in my chosen field during a period of economic depression 60 years ago. We decided that MIT might be able to use the investment from our Heath property to help fund educational programs on the cutting edge, similar to those that prepared me for the early days of television development.

**For more information** about MIT Life Income Funds, write or call D. Hugh Darden, W. Kevin Larkin or Frank H. McGrory at MIT, 77 Massachusetts Avenue, Room 4-234, Cambridge, Massachusetts 02139-4307; (617) 253-3827.

Photo: Richard Howard

# HONORARY PROFILE

## TECHNOLOGY UPDATE

# New device turns any electrical outlet into a phone jack

*Engineering breakthrough gives you unlimited phone extensions without wires or expensive installation fees*

By Charles Anton

**Y**ou don't have to have a teenager to appreciate having extra phone jacks. Almost everyone wishes they had more phone jacks around the house.

When I decided to put an office in my home, I called the phone company to find out how much it would cost to add extra phone jacks. Would you believe it was \$158?

## No more excuses.

Today, there are a thousand reasons to get an extra phone jack and a thousand excuses not to get one. Now an engineering breakthrough allows you to add a jack anywhere you have an electrical outlet. Without the hassle. Without the expense. And without the miles of wires.

## Like plugging in an appliance.

Now you can add extensions with a remarkable new device called the Wireless Phone Jack. It allows you to convert your phone signal into an FM signal and then broadcast it over your home's existing electrical wiring.

Just plug the transmitter into a phone jack and an electrical outlet. You can then insert a receiver into any outlet anywhere in your house. You'll be

able to move your phone to rooms or areas that have never had jacks before.

**Clear reception at any distance.** The Wireless Phone Jack uses your home's existing electrical wiring to transmit signals. This gives you sound quality that far exceeds cordless phones. It even exceeds the quality of previous devices. In fact, the Wireless Phone Jack has ten times the power of its predecessor.

Your range extends as far as you have electrical outlets: five feet or five hundred feet. If you have an outlet, you can turn it into a phone jack—no matter how far away it is. The Wireless Phone Jack's advanced companding noise reduction features guarantee you crystal-clear reception throughout even the largest home.

## Privacy guarantee.

You can use The Wireless Phone Jack in any electrical outlet in or around your home, even if it's on a different circuit than the transmitter. Each Wireless Phone Jack uses one of 65,000 different security codes. You can be assured that only your receiver will be able to pick up transmissions from your transmitter.

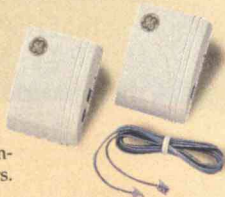
## Is the Wireless Phone Jack right for you?

The Wireless Phone Jack works with any single-line phone device. Almost anyone could use it, especially if...

- **Few jacks.** You want more phone extensions without the hassle and expense of calling the phone company.
- **Bad location.** You have jacks, but not where you need them most, like in the kitchen, garage, home office or outside on the deck.
- **Renting.** You want to add extensions, but you don't want to pay each time you move.
- **Other phone devices.** You have an answering machine, modem or fax machine you want to move to a more convenient place.

## The Wireless Phone Jack System

consists of a transmitter (right) and a receiver (left). One transmitter will operate an unlimited number of receivers.



**Unlimited extensions—no monthly charge.** Most phone lines can only handle up to five extensions with regular phone jacks. Not with the Wireless Phone Jack. All you need is one transmitter, and you can add as many receivers as you want. Six, ten, there's no limit. And with the Wireless Phone Jack, you'll never get a monthly charge for the extra receivers.

## Works with any phone device.

This breakthrough technology will fulfill all of your single-line phone needs. It has a special digital interface for use with your fax machine or modem. You can even use it with your answering machine just by plugging it into the Wireless Phone Jack receiver.

## Special factory-direct offer.

To introduce this new technology, we are offering a special factory-direct package. For a limited time, the transmitter is only \$49. One transmitter works an unlimited number of receivers priced at \$49 for the first one and \$39 for each additional receiver. Plus, with any Wireless Phone Jack purchase, we'll throw in a phone card with 30 minutes of long distance (a \$30 value) for only \$9.95!

**Try it risk-free.** The Wireless Phone Jack is backed by Comtrad's exclusive 30-day risk-free home trial. If you're not completely satisfied, return it for a full "No Questions Asked" refund. It is also backed by a one-year manufacturer's limited warranty. Most orders are processed within 72 hours and shipped UPS.

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**Wireless Phone Jack receiver .....\$49 \$4 S&H**  
**save \$10 on each additional receiver—\$39**

**30-minute long distance phone card.....\$30**  
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*The Wireless Phone Jack lets you add a phone, modem, fax machine or answering machine almost anywhere.*

# Revisiting Solar Power's Past

BY CHARLES SMITH

*Inventors unlocked the secrets of turning the sun's rays into mechanical power more than a century ago, only to see their dream machines collapse from lack of public support.*

*Modern solar engineers must not be doomed to relive their fate.*



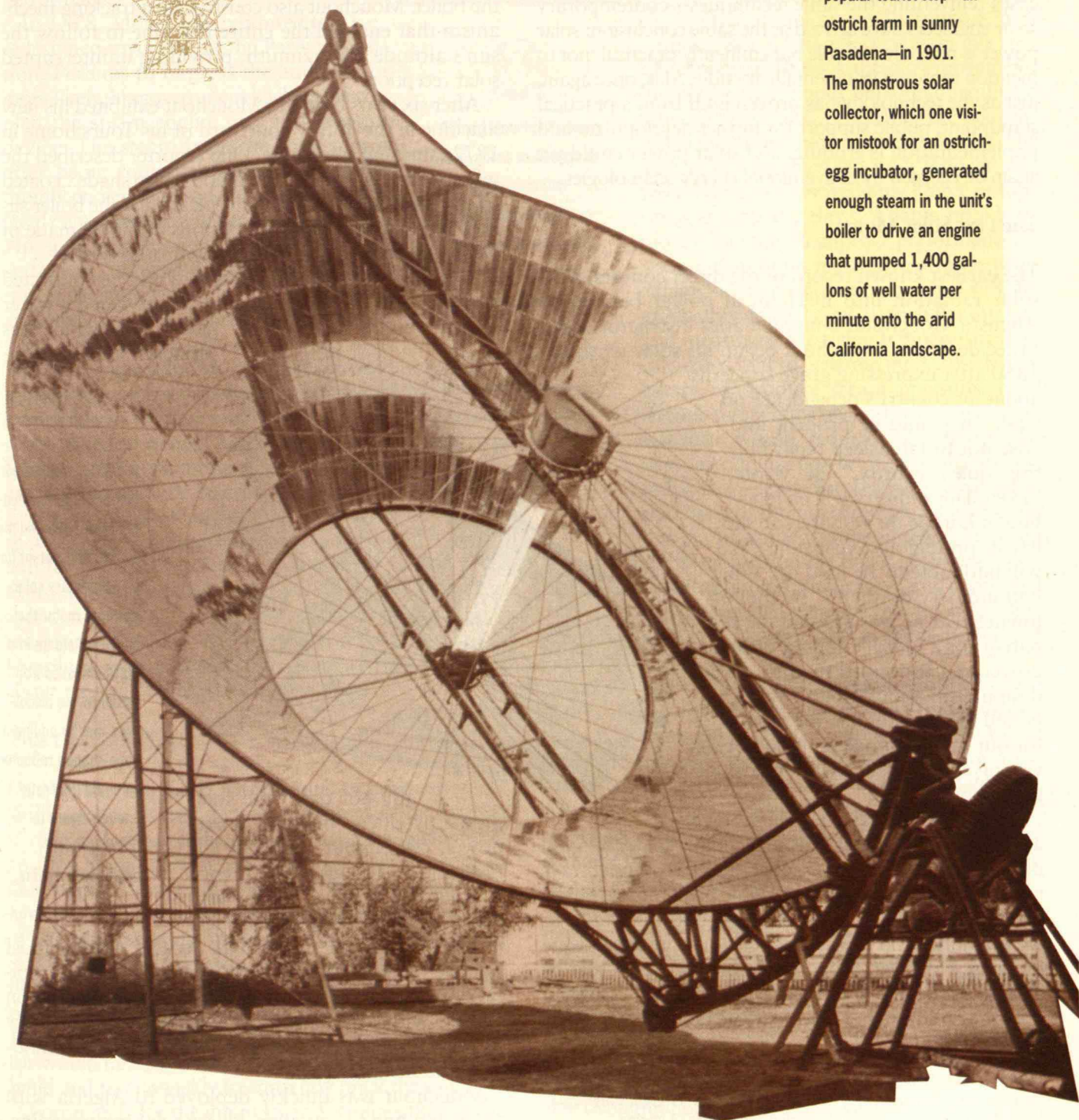
**M**ANY of us assume that the nation's first serious push to develop renewable fuels was spawned while angry Americans waited in gas lines during the "energy crisis" of the 1970s. Held hostage by the OPEC oil embargo, the country suddenly seemed receptive to warnings from scientists, environmentalists, and even a few politicians to end its overreliance on finite coal and oil reserves or face severe economic distress and political upheaval. ☀

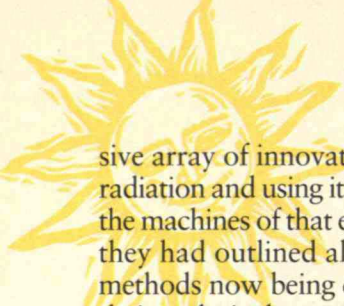
But efforts to design and construct devices for supplying renewable energy actually began some 100 years before that turbulent time—ironically, at the very height of the Industrial Revolution, which was largely founded on the promise of seemingly inexhaustible supplies of fossil fuels. Contrary to the prevailing opinion of the day, a number of engineers questioned the practice of an industrial economy based on nonrenewable energy and worried about what the world's nations would do after exhausting the fuel supply.

☀ More important, many of these visionaries did not just provide futuristic rhetoric but actively explored almost all the renewable energy options familiar today. In the end, most decided to focus on solar power, reasoning that the potential rewards outweighed the technical barriers. In less than 50 years, these pioneers developed an impres-



Boston inventor Aubrey Eneas exhibited the world's first commercial sun-powered motor at a popular tourist stop—an ostrich farm in sunny Pasadena—in 1901. The monstrous solar collector, which one visitor mistook for an ostrich-egg incubator, generated enough steam in the unit's boiler to drive an engine that pumped 1,400 gallons of well water per minute onto the arid California landscape.





sive array of innovative techniques for capturing solar radiation and using it to produce the steam that powered the machines of that era. In fact, just before World War I, they had outlined all of the solar thermal conversion methods now being considered. Unfortunately, despite their technical successes and innovative designs, their work was largely forgotten for the next 50 years in the rush to develop fossil fuels for an energy-hungry world.

Now, a century later, history is repeating itself. After following the same path as the early inventors—in some cases reinventing the same techniques—contemporary solar engineers have arrived at the same conclusion: solar power is not only possible but eminently practical, not to mention more environmentally friendly. Alas, once again, just as the technology has proven itself from a practical standpoint, public support for further development and implementation is eroding, and solar power could yet again be eclipsed by conventional energy technologies.

### The First Solar Motor

The earliest known record of the direct conversion of solar radiation into mechanical power belongs to Auguste Mouchout, a mathematics instructor at the Lycée de Tours. Mouchout began his solar work in 1860 after expressing grave concerns about his country's dependence on coal. "It would be prudent and wise not to fall asleep regarding this quasi-security," he wrote. "Eventually industry will no longer find in Europe the resources to satisfy its prodigious expansion. Coal will undoubtedly be used up. What will industry do then?" By the following year he was granted the first patent for a motor running on solar power and continued to improve his design until about 1880. During this period the inventor laid the foundation for our modern understanding of converting solar radiation into mechanical steam power.

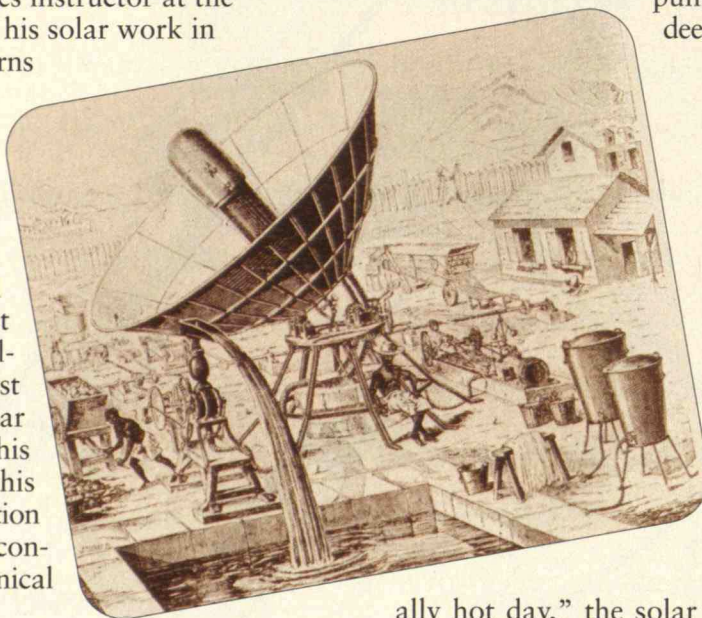
Mouchout's initial experiments involved a glass-enclosed iron cauldron: incoming solar radiation passed through the glass cover, and the trapped rays transmitted heat to the water. While this simple arrangement boiled water, it was of little practical value because the quantities and pressures of steam it produced were minimal. However, Mouchout soon discovered that by adding a reflector to concentrate additional radiation onto the cauldron, he could generate more steam. In late

1865, he succeeded in using his apparatus to operate a small, conventional steam engine.

By the following summer, Mouchout displayed his solar motor to Emperor Napoleon III in Paris. The monarch, favorably impressed, offered financial assistance for developing an industrial solar motor for France. With the newly acquired funds, Mouchout enlarged his invention's capacity, refined the reflector, redesigning it as a truncated cone, like a dish with slanted sides, to more accurately focus the sun's rays on the boiler. Mouchout also constructed a tracking mechanism that enabled the entire machine to follow the sun's altitude and azimuth, providing uninterrupted solar reception.

After six years of work, Mouchout exhibited his new machine in the library courtyard of his Tours home in 1872, amazing spectators. One reporter described the reflector as an inverted "mammoth lamp shade...coated on the inside with very thin silver leaf" and the boiler sitting in the middle as an "enormous thimble" made of blackened copper and "covered with a glass bell."

Anxious to put his invention to work, he connected the apparatus to a steam engine that powered a water pump. On what was deemed "an exception-



In 1861, French solar pioneer Auguste Mouchout was granted the world's first patent for a rudimentary solar-powered motor that produced steam in a glass-enclosed iron cauldron. He discovered that by adding a cone-shaped reflector, he could generate enough steam to drive a one-half-horsepower engine.

ally hot day," the solar motor produced one-half horsepower. Mouchout reported the results and findings to the French Academy of Science. The government, eager to exploit the new invention to its fullest potential, decided that the most suitable venue for the new machine would be the tropical climes of the French protectorate of Algeria, a region blessed with almost constant sunshine and entirely dependent on coal, a prohibitively expensive commodity in the African region.

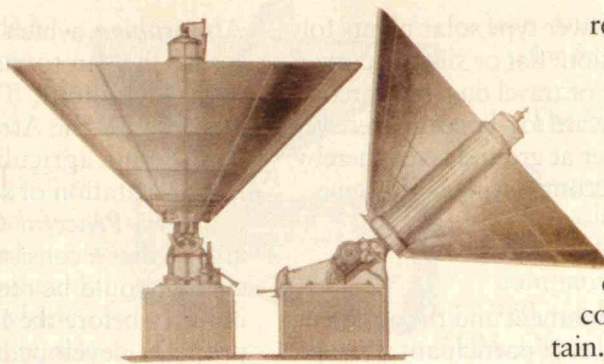
Mouchout was quickly deployed to Algeria with ample funding to construct a large solar steam engine.

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He first decided to enlarge his invention's capacity yet again to 100 liters (70 for water and 30 for steam) and employ a multi-tubed boiler instead of the single cauldron. The boiler tubes had a better surface-area-to-water ratio, yielding more pressure and improved engine performance.

In 1878, Mouchout exhibited the redesigned invention at the Paris Exposition. Perhaps to impress the audience or, more likely, his government backers, he coupled the steam engine to a refrigeration device. The steam from the solar motor, after being routed through a condenser, rapidly cooled the inside of a separate insulated compartment. He explained the result: "In spite of the seeming paradox of the statement, [it was] possible to utilize the rays of the sun to make ice." Mouchout was awarded a medal for his accomplishments.

By 1881 the French Ministry of Public Works, intrigued by Mouchout's machine, appointed two commissioners to assess its cost efficiency. But after some 900 observations at Montpellier, a city in southern France, and Constantine, Algeria, the government deemed the device a technical success but a practical failure. One reason was that France had recently improved its system for transporting coal and developed a better relationship with England, on which it was dependent for that commodity. The price of coal had thus dropped, rendering the need for alternatives less attractive. Unable to procure further financial assistance, Mouchout returned to his academic pursuits.



Among Mouchout's many innovations were a tracking mechanism that enabled the reflector to follow the sun's altitude and azimuth, thereby maximizing the collection of solar radiation, and a multi-tubed boiler that raised the device's surface-area-to-water ratio to generate additional steam pressure.

registrar did not spend all his time finding faults in the French inventor's efforts, but offered some creative solutions. For example, Adams was convinced that a reflector of flat silvered mirrors arranged in a semi-circle would be cheaper to construct and easier to maintain. His plan was to build a large

rack of many small mirrors and adjust each one to reflect sunlight in a specific direction. To track the sun's movement, the entire rack could be rolled around a semicircular track, projecting the concentrated radiation onto a stationary boiler. The rack could be attended by a laborer and would have to be moved only "three or four times during the day," Adams noted, or more frequently to improve performance.

Confident of his innovative arrangement, Adams began construction in late 1878. By gradually adding 17-by-10-inch flat mirrors and measuring the rising temperatures, he calculated that to generate the 1,200° F necessary to produce steam pressures high enough to operate conventional engines, the reflector would require 72 mirrors. To demonstrate the power of the concentrated radiation, Adams placed a piece of wood in the focus of the mirrored panes where, he noted, "it ignited immediately." He then

arranged the collectors around a boiler, retaining Mouchout's enclosed cauldron configuration, and connected it to a 2.5-horsepower steam engine that operated during daylight hours "for a fortnight in the compound of [his] bungalow."

Eager to display his invention, Adams notified newspapers and invited his important friends—including the Army's commander in chief, a colonel from the Royal Engineers, the secretary of public works, various justices, and principal mill owners—to a demonstration. Adams wrote that all were impressed, even the local engineers who, while doubtful that solar power could compete directly with coal and wood, thought it could be a practical supplemental energy source.

Adams's experimentation ended soon after the demonstration, though, perhaps because he had achieved his goal of proving the feasibility of his basic design, but more likely because, as some say, he lacked sufficient entrepreneurial drive. Even so, his legacy of producing a powerful and versatile way to harness and convert solar heat survives. Engineers today know this design as the Power Tower concept, which is one of the best configurations for large scale, centralized solar plants.

## The Tower of Power

During the height of Mouchout's experimentation, William Adams, the deputy registrar for the English Crown in Bombay, India, wrote an award-winning book entitled *Solar Heat: A Substitute for Fuel in Tropical Countries*. Adams noted that he was intrigued with Mouchout's solar steam engine after reading an account of the Tours demonstration, but that the invention was impractical, since "it would be impossible to construct [a dish-shaped reflector] of much greater dimensions" to generate more than Mouchout's one-half horsepower. The problem, he felt, was that the polished metal reflector would tarnish too easily, and would be too costly to build and too unwieldy to efficiently track the sun.

Fortunately for the infant solar discipline, the English

In fact, most of the modern tower-type solar plants follow Adams's basic configuration: flat or slightly curved mirrors that remain stationary or travel on a semicircular track and either reflect light upward to a boiler in a receiver tower or downward to a boiler at ground level, thereby generating steam to drive an accompanying heat engine.

### Collection without Reflection

Even with Mouchout's abandonment and the apparent disenchantment of England's sole participant, Europe continued to advance the practical application of solar heat, as the torch returned to France and engineer Charles Tellier. Considered by many the father of refrigeration, Tellier actually began his work in refrigeration as a result of his solar experimentation, which led to the design of the first nonconcentrating, or non-reflecting, solar motor.

In 1885, Tellier installed a solar collector on his roof similar to the flat-plate collectors placed atop many homes today for heating domestic water. The collector was composed of ten plates, each consisting of two iron sheets riveted together to form a watertight seal, and connected by tubes to form a single unit. Instead of filling the plates with water to produce steam, Tellier chose ammonia as a working fluid because of its significantly lower boiling point. After solar exposure, the containers emitted enough pressurized ammonia gas to power a water pump he had placed in his well at the rate of some 300 gallons per hour during daylight. Tellier considered his solar water pump practical for anyone with a south-facing roof. He also thought that simply adding plates, thereby increasing the size of the system, would

*Atmosphere*, which included details on his intentions to use the sun to manufacture ice. Like his countryman Mouchout, Tellier envisioned that the large expanses of the African plains could become industrially and agriculturally productive through the implementation of solar power.

In *The Peaceful Conquest of West Africa*, Tellier argued that a consistent and readily available supply of energy would be required to power the machinery of industry before the French holdings in Africa could be properly developed. He also pointed out that even though the price of coal had fallen since Mouchout's experiments, fuel continued to be a significant expense in French operations in Africa. He therefore concluded that the construction costs of his low-temperature, non-concentrating solar motor were low enough to justify its implementation. He also noted that his machine was far less costly than Mouchout's device, with its dish-shaped reflector and complicated tracking mechanism.

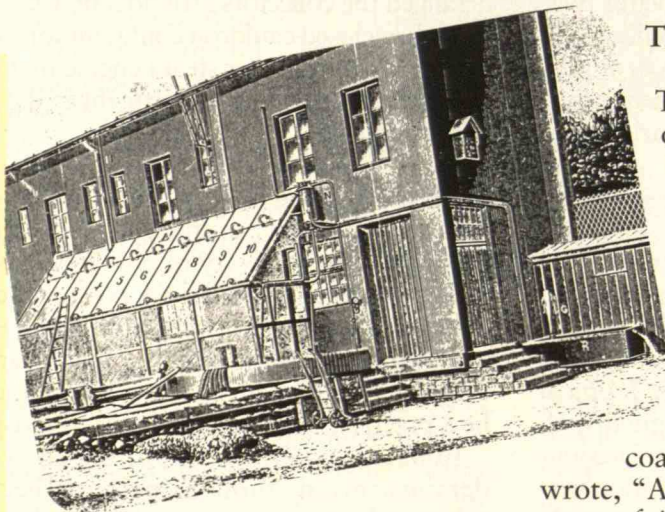
Yet despite this potential, Tellier evidently decided to pursue his refrigeration interests instead, and do so without the aid of solar heat. Most likely the profits from conventionally operated refrigerators proved irresistible. Also, much of the demand for the new cooling technology now stemmed from the desire to transport beef to Europe from North and South America. The rolling motion of the ships combined with space limitations precluded the use of solar power altogether. And as Tellier redirected his focus, France saw the last major development of solar mechanical power on her soil until well into the twentieth century. Most experimentation in the fledgling discipline crossed the Atlantic to that new bastion of mechanical ingenuity, the United States.

### The Parabolic Trough

Though Swedish by birth, John Ericsson was one of the most influential and controversial U.S. engineers of the nineteenth century. While he spent his most productive years designing machines of war—his most celebrated accomplishment was the Civil War battleship the *Monitor*—he dedicated the last 20 years of his life largely to more peaceful pursuits such as solar power. This work was inspired by a fear shared by virtually all of his fellow solar inventors that coal supplies would someday end. In 1868 he wrote, "A couple of thousand years dropped in the ocean of time will completely exhaust the coal fields of Europe, unless, in the meantime, the heat of the sun be employed."

Thus by 1870 Ericsson had developed what he claimed to be the first solar-powered steam engine, dismissing Mouchout's machine as "a mere toy." In truth, Ericsson's first designs greatly resembled Mouchout's

In 1885, French engineer Charles Tellier placed iron containers filled with liquid ammonia, which has a lower boiling point than water, on a south-facing roof of his home. While exposed to the sun, the sealed plates generated enough ammonia gas to power a pump that drew 300 gallons of well water per hour.



make industrial applications possible.

By 1889 Tellier had increased the efficiency of the collectors by enclosing the top with glass and insulating the bottom. He published the results in *The Elevation of Water with the Solar*

devices, employing a conical, dish-shaped reflector that concentrated solar radiation onto a boiler and a tracking mechanism that kept the reflector directed toward the sun.

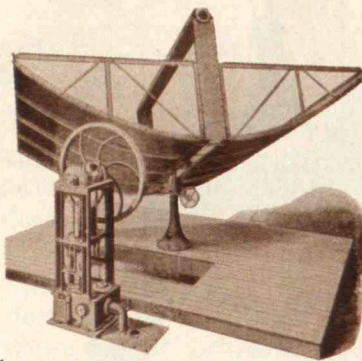
Though unjustified in claiming his design original, Ericsson soon did invent a novel method for collecting solar rays—the parabolic trough. Unlike a true parabola, which focuses solar radiation onto a single, relatively small area, or focal point, like a satellite television dish, a parabolic trough is more akin to an oil drum cut in half lengthwise that focuses solar rays in a line across the open side of the reflector.

This type of reflector offered many advantages over its circular (dish-shaped) counterparts: it was comparatively simple, less expensive to construct, and, unlike a circular reflector, had only to track the sun in a single direction (up and down, if lying horizontal, or east to west if standing on end), thus eliminating the need for complex tracking machinery. The downside was that the device's temperatures and efficiencies were not as high as with a dish-shaped reflector, since the configuration spread radiation over a wider area—a line rather than a point. Still, when Ericsson constructed a single linear boiler (essentially a pipe), placed it in the focus of the trough, positioned the new arrangement toward the sun, and connected it to a conventional steam engine, he claimed the machine ran successfully, though he declined to provide power ratings.

The new collection system became popular with later experimenters and eventually became a standard for modern plants. In fact, the largest solar systems in the last decade have opted for Ericsson's parabolic trough reflector because it strikes a good engineering compromise between efficiency and ease of operation.

For the next decade, Ericsson continued to refine his invention, trying lighter materials for the reflector and simplifying its construction. By 1888, he was so confident of his design's practical performance that he planned to mass-produce and supply the apparatus to the "owners of the sunburnt lands on the Pacific coast" for agricultural irrigation.

Unfortunately for the struggling discipline, Ericsson died the following year. And because he was a suspicious and, some said, paranoid man who kept his designs to himself until he filed patent applications, the detailed plans for his improved sun motor died with him. Nevertheless, the search for a practical solar motor was not abandoned. In fact, the experimenta-



During the 1880s, in an attempt to surpass Auguste Mouchout, U.S. engineer John Ericsson reshaped the conventional dish-shaped reflector into a parabolic trough. His aim was to focus the sun's radiation in a line, rather than a point, onto a long boiler tube placed above the open face of the reflector.

tion and development of large-scale solar technology was just beginning.

### The First Commercial Venture

Boston resident Aubrey Eneas began his solar motor experimentation in 1892, formed the first solar power company (The Solar Motor Co.) in 1900, and continued his work until 1905. One of his first efforts resulted in a reflector much like Ericsson's early parabolic trough. But Eneas found that it could not attain sufficiently high temperatures, and, unable to unlock his predecessor's secrets, decided to scrap the concept altogether and return to Mouchout's truncated-cone reflector. Unfortunately, while Mouchout's approach resulted in higher temperatures, Eneas was still dissatisfied with the machine's performance. His solution was to make the bottom of the reflector's truncated cone-shaped dish larger by designing its sides to be more upright to focus radiation onto a boiler that was 50 percent larger.

Finally satisfied with the results, he decided to advertise his design by exhibiting it in sunny Pasadena, Calif., at Edwin Cawston's ostrich farm, a popular tourist attraction. The monstrous machine did not fail to attract attention. Its reflector, which spanned 33 feet in diameter, contained 1,788 individual mirrors. And its boiler, which was about 13 feet in length and a foot wide, held 100 gallons of water. After exposure to the sun, Eneas's device boiled the water and transferred steam through a flexible pipe to an engine that pumped 1,400 gallons of water per minute from a well onto the arid California landscape.

Not everyone grasped the concept. In fact, one man thought the solar machine had something to do with the incubation of ostrich eggs. But Eneas's marketing savvy eventually paid off. Despite the occasional misconceptions, thousands who visited the farm left convinced that the sun machine would soon be a fixture in the sunny Southwest. Moreover, many regional newspapers and popular-science journals sent reporters to the farm to cover the spectacle. To Frank Millard, a reporter for the brand new magazine *World's Work*, the potential of solar motors placed in quantity across the land inspired futuristic visions of a region "where oranges may be growing, lemons yellowing, and grapes purpling, under the glare of the sun which, while it ripens the fruits it will also water and nourish them." He also predicted that the potential for this novel machine was not limited to irrigation: "If the sun motor will pump

water, it will also grind grain and saw lumber and run electric cars."

The future, like the machine itself, looked bright and shiny. In 1903 Eneas, ready to market his solar motor, moved his Boston-based company to Los Angeles, closer to potential customers. By early the following year he had sold his first complete system for \$2,160 to Dr. A. J. Chandler of Mesa, Ariz. Unfortunately, after less than a week, the rigging supporting the heavy boiler weakened during a windstorm and collapsed, sending it tumbling into the reflector and damaging the machine beyond repair.

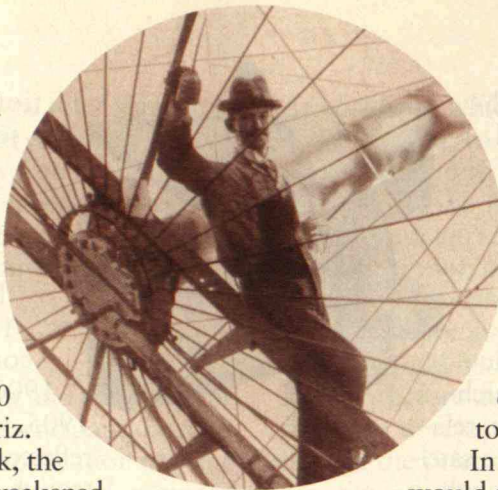
But Eneas, accustomed to setbacks, decided to push onward and constructed another solar pump near Tempe, Ariz. Seven long months later, in the fall of 1904, John May, a rancher in Wilcox, Ariz., bought another machine for \$2,500. Unfortunately, shortly afterward, it was destroyed by a hailstorm. This second weather-related incident all but proved that the massive parabolic reflector was too susceptible to the turbulent climactic conditions of the desert southwest. And unable to survive on such measly sales, the company soon folded.

Though the machine did not become a fixture as Eneas had hoped, the inventor contributed a great deal of scientific and technical data about solar heat conversion and initiated more than his share of public exposure. Despite his business failure, the lure of limitless fuel was strong, and while Eneas and the Solar Motor Company were suspending their operations, another solar pioneer was just beginning his.

### Moonlight Operation

Henry E. Willsie began his solar motor construction a year before Eneas's company folded. In his opinion, the lessons of Mouchout, Adams, Ericsson, and Eneas proved the cost inefficiency of high-temperature, concentrating machines. He was convinced that a nonreflective, lower-temperature collection system similar to Tellier's invention was the best method for directly utilizing solar heat. The inventor also felt that a solar motor would never be practical unless it could operate around the clock. Thus thermal storage, a practice that lent itself to low-temperature operation, was the focus of his experimentation.

To store the sun's energy, Willsie built large flat-plate collectors that heated hundreds of gallons of water, which he kept warm all night in a huge insulated basin.



In 1904, Aubrey Eneas sold the first two commercial solar motors, both of which were used to pump water for irrigation in Arizona. Unfortunately, high winds soon blew down the machines, proving that his design, which featured a massive parabolic reflector, was impractical.

He then submerged a series of tubes, or vaporizing pipes, inside the basin to serve as boilers. When the acting medium—Willsie preferred sulfur dioxide to Tellier's ammonia—passed through the pipes, it transformed into a high-pressure vapor, which passed to the engine, operated it, and exhausted into a condensing tube, where it cooled, returned to a liquid state, and was reused.

In 1904, confident that his design would produce continuous power, he built two plants, a 6-horsepower facility in St. Louis, Mo., and a 15-horsepower operation in Needles, Calif. And after several power trials, Willsie decided to test the storage capacity of the larger system. After darkness had fallen, he opened a valve that "allowed the solar-heated water to flow over the exchanger pipes and thus start up the engine." Willsie had created the first solar device that could operate at night using the heat gathered during the day. He also announced that the 15-horsepower machine was the most powerful arrangement constructed up to that time. Beside offering a way to provide continuous solar power production, Willsie also furnished detailed cost comparisons to justify his efforts: the solar plant exacted a two-year payback period, he claimed, an exceptional value even when compared with today's stan-

dards for alternative energy technology.

Originally, like Ericsson and Eneas before him, Willsie planned to market his device for desert irrigation. But in his later patents Willsie wrote that the invention was "designed for furnishing power for electric light and power, refrigerating and ice making, for milling and pumping at mines, and for other purposes where large amounts of power are required."

Willsie determined all that was left to do was to offer his futurist invention for sale. Unfortunately, no buyers emerged. Despite the favorable long-term cost analysis, potential customers were suspicious of the machine's durability, deterred by the high ratio of machine size to power output, and fearful of the initial investment cost of Willsie's ingenious solar power plant. His company, like others before it, disintegrated.

### A Certain Technical Maturity

Despite solar power's dismal commercial failures, some proponents continued to believe that if they could only find the right combination of solar technologies, the vision of a free and unlimited power source would come

true. Frank Shuman was one who shared that dream. But unlike most dreamers, Shuman did not have his head in the clouds. In fact, his hardheaded approach to business and his persistent search for practical solar power led him and his colleagues to construct the largest and most cost-effective machine prior to the space age.

Shuman's first effort in 1906 was similar to Willsie's flat-plate collector design except that it employed ether as a working fluid instead of sulfur dioxide. The machine performed poorly, however, because even at respectable pressures, the steam—or more accurately, the vapor—exerted comparatively little force to drive a motor because of its low specific gravity.

Shuman knew he needed more heat to produce steam, but felt that using complicated reflectors and tracking devices would be too costly and prone to mechanical failure. He decided that rather than trying to generate more heat, the answer was to better conserve the heat already being absorbed.

In 1910, to improve the collector's insulation properties, Shuman enclosed the absorption plates not with a single sheet of glass but with dual panes separated by a one-inch air space. He also replaced the boiler pipes with a thin, flat metal container similar to Tellier's original greenhouse design. The apparatus could now consistently boil water rather than ether. Unfortunately, however, the pressure was still insufficient to drive industrial-size steam engines, which were designed to operate under pressures produced by hotter-burning coal or wood.

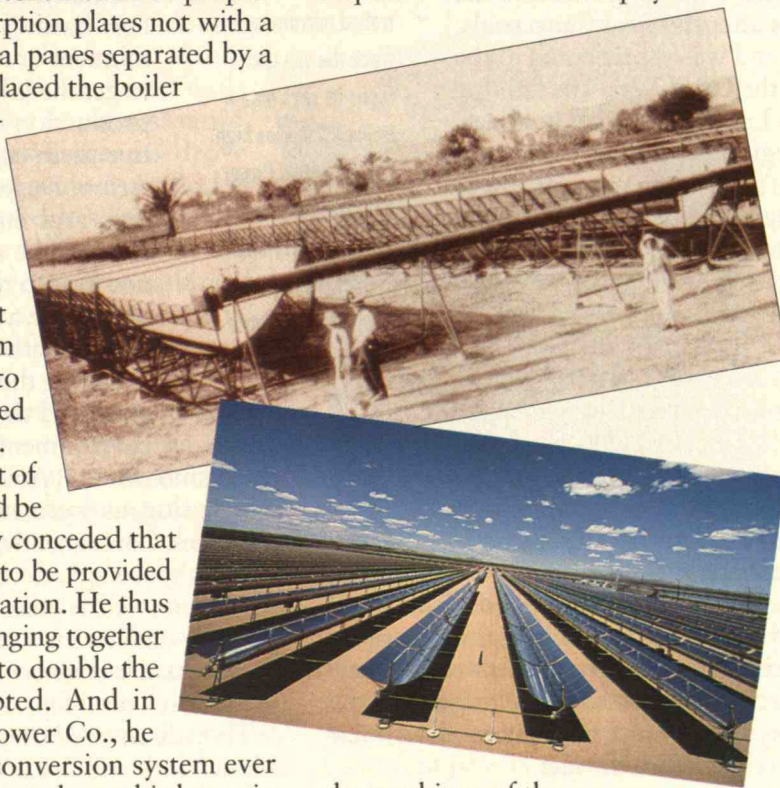
After determining that the cost of building a larger absorber would be prohibitive, Shuman reluctantly conceded that the additional heat would have to be provided through some form of concentration. He thus devised a low-cost reflector stringing together two rows of ordinary mirrors to double the amount of radiation intercepted. And in 1911, after forming the Sun Power Co., he constructed the largest solar conversion system ever built. In fact, the new plant, located near his home in Talcony, Penn., intercepted more than 10,000 square feet of solar radiation. The new arrangement increased the amount of steam produced, but still did not provide the pressure he expected.

Not easily defeated, Shuman figured that if he couldn't raise the pressure of the steam to run a conventional steam engine, he would have to redesign the engine to operate at lower pressures. So he teamed up with E.P. Haines, an engineer who suggested that more precise milling, closer tolerances in the moving components, and lighter-weight materials would do the trick.

Haines was right. When the reworked engine was connected to the solar collectors, it developed 33 horsepower and drove a water pump that gushed 3,000 gallons per minute onto the Talcony soil.

Shuman calculated that the Talcony plant cost \$200 per horsepower compared with the \$80 of a conventionally operated coal system—a respectable figure, he pointed out, considering that the additional investment would be recouped in a few years because the fuel was free. Moreover, the fact that this figure was not initially competitive with coal or oil-fired engines in the industrial Northeast did not concern him because, like the French entrepreneurs before him, he was planning to ship the machine to the vast sunburnt regions in North Africa.

To buy property and move the machine there, new investors were solicited from England and the Sun Power Co. Ltd. was created. But with the additional financial support came stipulations. Shuman was required to let British physicist C. V. Boys review



In 1912, U.S. entrepreneur Frank Shuman built his era's largest and most cost-effective solar machines near Cairo, Egypt (top), using rows of sun-tracking parabolic troughs to focus radiation onto glass-enclosed boiler tubes. In the mid-1980s, the Los Angeles-based Luz Co., the world's largest producer of solar electricity, used virtually identical parabolic troughs in its 80-megawatt electric power plant (bottom).

the workings of the machine and suggest possible improvements. In fact, the physicist recommended a radical change. Instead of flat mirrors reflecting the sun onto a flat-plate configuration, Boys thought that a parabolic trough focusing on a glass-encased tube would perform much better. Shuman's technical consultant A.S.E. Ackermann agreed, but added that to be effective, the trough would need to track the sun continuously. Shuman felt that his conception of a simple system was rapidly disintegrating.

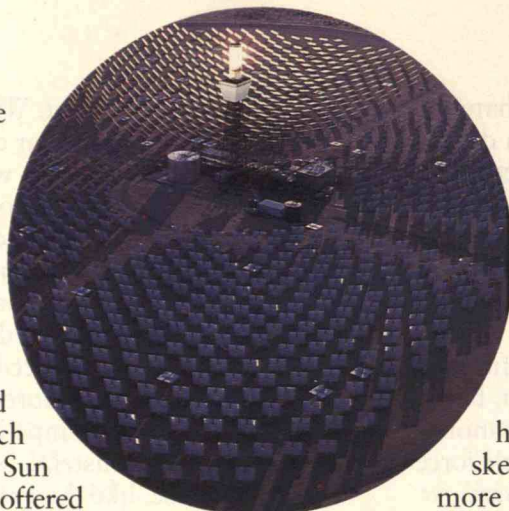
Fortunately, when the machine was completed just outside of Cairo, Egypt, in 1912, Shuman's fears that the increased complexity would render the device impractical proved unfounded. The Cairo plant outperformed the Talcony model by a large margin—the machine produced 33 percent more steam and generated more than 55 horsepower—which more than offset the higher costs. Sun Power Co.'s solar pumping station offered an excellent value of \$150 per horsepower, significantly reducing the payback period for solar-driven irrigation in the region. It looked as if solar mechanical power had finally developed the technical sophistication it needed to compete with coal and oil.

Unfortunately, the beginning was also the end. Two months after the final Cairo trials, Archduke Ferdinand was assassinated in the Balkans, igniting the Great War. The fighting quickly spread to Europe's colonial holdings, and the upper regions of Africa were soon engulfed. Shuman's solar irrigation plant was destroyed, the engineers associated with the project returned to their respective countries to perform war-related tasks, and Frank Shuman died before the armistice was signed.

Whether or not Shuman's device would have initiated the commercial success that solar power desperately needed, we will never know. However, the Sun Power Co. can boast a certain technical maturity by effectively synthesizing the ideas of its predecessors from the previous 50 years. The company used an absorber (though in linear form) of Tellier and Willsie, a reflector similar to Ericsson's, simple tracking mechanisms first used by Mouchout and later employed by Eneas, and combined them to operate an engine specially designed to run with solar-generated steam. In effect, Shuman and his colleagues set the standard for many of the most popular modern solar systems 50 to 60 years before the fact.

### The Most Rational Source

The aforementioned solar pioneers were only the most notable inventors involved in the development of solar thermal power from 1860 to 1914. Many others contributed to the more than 50 patents and the scores of books and articles on the subject. With all this sophistication, why couldn't solar mechanical technology blossom into a viable industry? Why did the discipline take a 50-year dive before again gaining a measure of popular interest and technical attention?



The Edison solar plant in Daggett, Calif., uses computer-controlled mirrors to track the sun and focus its rays onto a boiler 20 stories high. This so-called Power Tower concept was originally developed in 1878 by Englishman William Adams in Bombay, India.

First, despite the rapid advances in solar mechanical technology, the industry's future was rendered problematic by a revolution in the use and transport of fossil fuels. Oil and coal companies had established a massive infrastructure, stable markets, and ample supplies. Also, besides trying to perfect the technology, solar pioneers had the difficult task of convincing skeptics to see solar energy as something more than a curiosity. Visionary rhetoric without readily tangible results was not well received by a population accustomed to immediate gratification. Improving and adapting existing power technology, deemed less risky and more controlled, seemed to make far more sense.

Finally, the ability to implement radically new hardware requires either massive commitment or the failure of existing technology to get the job done. Solar mechanical power production in the late nineteenth and early twentieth centuries did not meet either criterion. Despite warnings from noted scientists and engineers, alternatives to what seemed like an inexhaustible fuel supply did not fit into the U.S. agenda. Unfortunately, in many ways, these antiquated sentiments remain with us today.

During the 1970s, while the OPEC nations exercised their economic power and as the environmental and "no-nuke" movements gained momentum, Americans plotted an industrial coup whose slogans were energy efficiency and renewable resources. Consequently, mechanical solar power—along with its space-age, electricity-producing sibling photovoltaics, as well as other renewable sources such as wind power—underwent a revival. And during the next two decades, solar engineers tried myriad techniques to satisfy society's need for power.

They discovered that dish-shaped reflectors akin to Mouchout's and Eneas's designs were the most efficient but also the most expensive and difficult to maintain. Low-temperature, nonconcentrating systems like Willsie's and Tellier's, though simple and less sensitive to climatic conditions, were among the least powerful and therefore suited only to small, specific tasks. Stationary reflectors like those used in Adams's device, now called Power Tower systems, offered a better solution but were still pricey and damage prone.

By the mid-1980s, contemporary solar engineers, like their industrial-revolution counterparts Ericsson and Shuman, determined that for sunny areas, tracking parabolic troughs were the best compromise because

they exhibited superior cost-to-power ratios in most locations. Such efforts led engineers at the Los Angeles-based Luz Co. to construct an 80-megawatt electric power plant using parabolic trough collectors to drive steam-powered turbines. The company had already used similar designs to build nine other solar electric generation facilities, providing a total of 275 megawatts of power. In the process, Luz engineers steadily lowered the initial costs by optimizing construction techniques and taking advantage of economies of buying material in bulk to build ever-larger plants until the price dropped from 24 to 12 cents per kilowatt hour. The next, even larger plant—a 300-megawatt facility—scheduled for completion last year, promised to provide 6 to 7 cents per kilowatt hour, near the price of electricity produced by coal, oil, or nuclear technology.

Once again, as with Shuman and his team, the gap was closing. But once again these facilities would not be built. Luz, producer of more than 95 percent of the world's solar-based electricity, filed for bankruptcy in 1991. According to Newton Becker, Luz's chairman of the board, and other investors, the demise of the already meager tax credits, declining fossil fuel prices, and the bleak prospects for future assistance from both federal and state governments drove investors to withdraw from the project. As Becker concluded, "The failure of the world's largest solar electric company was not due to technological or business judgment failures but rather to failures of government regulatory bodies to recognize the economic and environmental benefits of solar thermal generating plants."

Other solar projects met with similar financial failure. For example, two plants that employed the tower power concept, Edison's 10-megawatt plant in Daggett, Calif., and a 30-megawatt facility built in Jordan performed well despite operating on a much smaller scale and without Luz's advantages of heavy initial capital investment and a lengthy trial-and-error process to improve efficiency. Still they were assessed as too costly to compete in the intense conventional fuel market.

Although some of our brightest engineers have produced some exemplary solar power designs during the past 25 years, their work reflects a disjointed solar energy policy. Had the findings of the early solar pioneers and the evolution of their machinery been more closely scrutinized, perhaps by Department of Energy officials or some other oversight committee, contemporary efforts might have focused on building a new infrastructure when social and political attitudes were more receptive to solar technology. Rather than rediscovering the technical merits of the various systems, we might have been better served by reviewing history, selecting a relatively small number of promising sys-

tems, and combining them with contemporary materials and construction techniques. Reinventing the wheel when only the direction of the cart seems suspect is certainly not the best way to reach one's destination.


While the best period to make our energy transition may have passed and though our energy future appears stable, the problems that initiated the energy crisis of the 1970s have not disappeared. Indeed, the instability of OPEC and the recent success in the Gulf War merely created an artificial sense of security about petroleum supplies.

While we should continue to develop clean, efficient petroleum and coal technology while our present supplies are plentiful, this approach should not dominate our efforts. Alternative, renewable energy technologies must eventually be implemented in tandem with their fossil-fuel counterparts. Not doing so would simply provide an excuse for maintaining the status quo and beg for economic disruption when reserves run low or political instability again erupts in oil-rich regions.



The flat-plate solar collector, pioneered more than 100 years ago by Charles Tel-lier to drive steam-powered pumps and engines, is today ubiquitous as a method of heating water for individual homes and businesses.

Toward that end, we must change the prevailing attitude that solar power is an infant field born out of the oil shocks and the environmental movement of the past 25 years. Such misconceptions lead many to assert that before solar power can become a viable alternative, the industry must first pay its dues with a fair share of technological evolution.

Solar technology already boasts a century of R&D, requires no toxic fuel and relatively little maintenance, is inexhaustible, and, with adequate financial support, is capable of becoming directly competitive with conventional technologies in many locations. These attributes make solar energy one of the most promising sources for many current and future energy needs. As Frank Shuman declared more than 80 years ago, it is "the most rational source of power." 

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# The Case for "Clipper"

BY DOROTHY E. DENNING

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HE U.S. GOVERNMENT HAS LAUNCHED A

PROGRAM TO EXPAND SECURITY AND PRIVACY

PROTECTION FOR ELECTRONIC COMMUNICATIONS

WHILE PRESERVING THE GOVERNMENT'S ABILITY

TO CONDUCT AUTHORIZED WIRETAPS.

DESPITE ATTACKS FROM CIVIL LIBERTARIANS,

THE APPROACH IS THE BEST WAY TO BALANCE

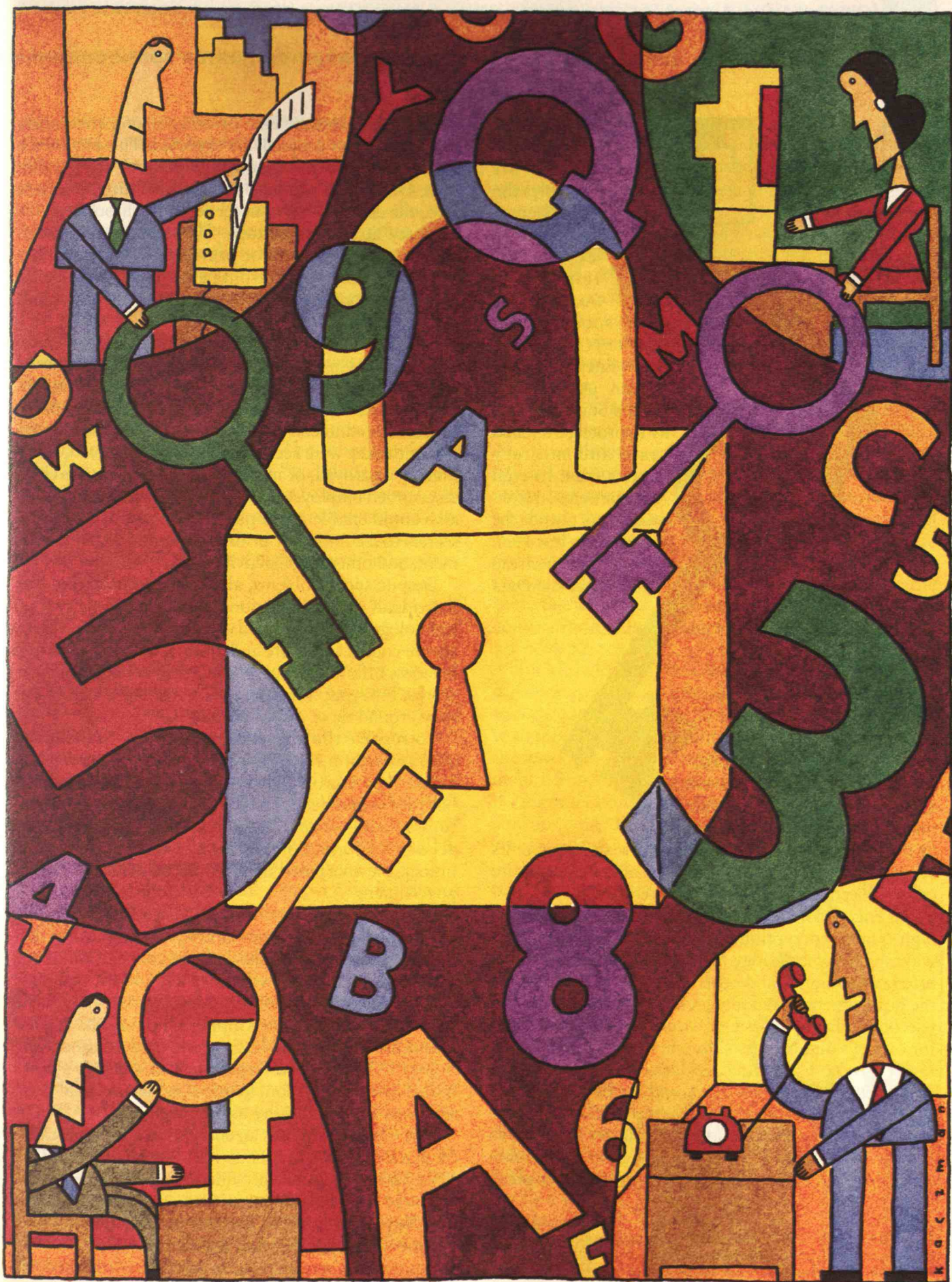
INDIVIDUAL PRIVACY WITH THE SOCIAL GOOD.

I

MAGINE you are the program manager for a new, energy-efficient airplane. You fax the design plans to the manager of an overseas plant that will manufacture parts of the plane. You also discuss the design by phone with engineers in the plant. A few months later, your company loses a bid for a fleet of planes to an overseas competitor who proposed a nearly identical design. The rival stole your plans by intercepting your voice and fax communications.



Fortunately, electronic communication can be protected against such industrial espionage with encryption — scrambling of data in such a manner that they are unintelligible to anyone other than the intended receiver: In today's digital world, communications are first converted into ones and zeroes. An encryption algorithm mathematically transforms these bits into a stream of digits that seems random. Performing the transformation requires a secret key — which is also a random-seeming string of ones and zeroes; the receiver uses this key to decrypt and recover the original message. The more digits there are in this key, the more secure the





protection; each additional bit doubles the number of possible combinations that a would be snooper must try.

Encryption has been used in the United States primarily to protect classified state and military secrets from foreign governments. However, its use outside the government has been steadily increasing ever since the Data

Encryption Standard (DES) was adopted as a federal standard in 1977. DES, which is based on a 56-bit key, is now used extensively by the banking industry to protect money transfers and by some corporations to protect sensitive communications transmitted through company networks or the telephone system. As individuals and companies swarm onto the Internet, they are also beginning to encrypt electronic mail and computer files.

But encryption is a dual-edged sword. The spread of high-quality encryption could undermine the value of wiretaps — a technology that has helped ensnare organized crime figures and other menaces to society. With the government essentially locked out, computers and telecommunications systems would become safe havens for outlaws and terrorists. In one recent child pornography case in California, evidence was concealed in encrypted computer files that could not be broken.

Encryption also could interfere with U.S. intelligence abroad, because it could allow a country like Iraq to operate behind a wall of electronic secrecy. Encryption technology is therefore subject to export controls: products that incorporate DES or other strong encryption methods cannot generally be exported. This has been a sore point with U.S. industry, which has argued that since DES-based products are manufactured overseas also, the controls have succeeded only in putting U.S. industry at a disadvantage. However, even though export controls have not prevented DES and other methods of encryption from being implemented elsewhere, the controls have protected valuable and fragile intelligence capabilities.

Encryption poses a threat to organizations and individuals, too. For effective secrecy, a minimal number of people should be allowed to know the encryption key. This practice invites disaster, though, as valuable information stored in encrypted files could become inaccessible if the key were accidentally lost or corrupted, intentionally destroyed, or maybe even held for ransom by a disgruntled employee or former employee. Encryption also could enable an employee to transmit corporate secrets to a competitor or to cover up fraud, embezzlement, and other illegal activity.

Despite such problems, almost everyone agrees that individuals and organizations need access to encryption technology. With the spread of computer networks, people are conducting more and more of their personal and business affairs through computer and telephone networks. Encryption is essential for erecting a wall of privacy around those communications.

To resolve the encryption dilemma, the Clinton administration in 1993 proposed a new approach, called "key-escrow" encryption. The idea is to make broadly available an essentially unbreakable encryption scheme. The catch: to allow for emergency access to information, the keys to unlock the keys to unlock the encrypted data would be held by the U.S. government.

The idea is to allow the most secure encryption, but with a built-in emergency decryption capability that allows authorized officials, with the cooperation of one or more trusted parties who hold keys, to decrypt data. The initial embodiment of this system is a microelectronic device called the Clipper chip, and its escrow agents are the National Institute of Standards and Technology (NIST) and the Department of Treasury's Automated Systems Division. In principle, commercial organizations also could serve as escrow agents.

The Clipper chip uses an encryption algorithm called Skipjack and keys of 80 bits—24 bits longer than DES keys. The extra 24 bits provides  $2^{24}$  or about 16 million times the security against trial-and-error guesses at keys. The Skipjack algorithm was designed by the National Security Agency (NSA) and is classified.

Some civil libertarians have adamantly opposed this

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plan, worrying that the key escrow system will put the communications of honest persons needlessly at risk. After all, they argue, criminals are not going to be dumb enough to use an encryption scheme to which the government holds the keys. The logical next step, they say, would be to outlaw other methods of encryption, striking a blow at citizens' right to communicate away from the government's eyes and ears. Thus, critics argue, Clipper heralds future erosions in privacy rights—Big Brother on a chip.

Actually, Clipper represents a more secure approach to encryption than the two other avenues that the government has considered. One approach would use an encryption method with short enough keys that it becomes practical for any eavesdropper to guess a key by trying all possibilities. The other would use long keys, but have a built-in "trapdoor" allowing someone familiar with the system to find the key. The problem with this approach is that someone else might discover the trapdoor. Clipper avoids these weaker methods, offering a high-security solution to the encryption dilemma.

#### HOLDING KEYS IN ESCROW

The specifications for Clipper were adopted last year as the Escrowed Encryption Standard for use with sensitive but unclassified telephone communications, including voice, fax, and data. The EES standard is voluntary; nongovernment agencies have no obligation to use it, and government agencies can choose between it and any other encryption standard, such as DES. With the U.S. government holding the keys, EES poses no threat to foreign intelligence operations and thus EES-based encryption products can be exported.

The first product to use the Clipper chip is a device that plugs into a standard phone between the handset and the base unit. Manufactured by AT&T, the device can encrypt any conversation as long as the party at the other end has a compatible device. After a call is established in the usual way, one party presses a button on the device to activate its "secure mode." The two devices then enter into a digital, behind-the-scenes conversation to establish a "session key" that is unique to the conversation. Each device passes this 80-bit session key to its Clipper chip; the Clipper uses this key to encrypt outgoing communications and decrypt incoming communications. Before encrypting any data, however, the chip computes and transmits a string of bits called the law enforcement access field (LEAF). The LEAF contains the session key for the conversation and is what enables authorized government officials to decrypt the data.

To protect the session key in the LEAF, it is itself encrypted. Each Clipper chip has a unique identifier (ID) and associated "device-unique key." The device-unique key is split into two components, each of which is given to a separate escrow agent. Using this device-unique key, the Clipper chip encrypts the session key. The encrypted session key is then put into the LEAF along with the chip ID. The entire LEAF is further encrypted under a common "family key" so that even the chip ID is not transmitted in the clear. These two layers of encryption provide a strong shield against an eavesdropper learning the session key and then decrypting the data.

Users of Clipper don't need to be aware of any of these details; they simply use their phones as always. The complexity surfaces when a law enforcement official encounters encrypted communications on a tapped phone line. First, the communications must be passed through a special device, known as a decrypt processor, to ascertain if they are Clipper communications. If they are, the processor locates and decrypts the LEAF, and then extracts the chip ID. (Because the same session key is used to encrypt both ends of the conversation, it is not necessary to obtain the chip ID for both parties.)

But knowledge of this chip ID alone will not allow the wiretap to be deciphered. What is needed are the two components of the device-unique key associated with this ID—and this information is what is held by the two key escrow agents. So the law enforcement officials, having obtained this ID, must request these components from the escrow agents. These key components are then entered into the decrypt processor, which combines them to form the device-unique key. This device-unique key, in turn, is used to decrypt the session key in the LEAF. Knowledge of this session key enables the conversation to be decrypted. If subsequent conversations on the intercepted line are encrypted, the decrypt processor can decrypt the session key directly, without going through the two escrow agents. This allows for real-time decryption.





## SAFEGUARDS

Critics maintain that the very idea of a key escrow system raises the risk that encrypted messages will be decoded by the wrong people. Without proper safeguards, an intruder might break into a computer containing escrowed keys, download the keys, and use the keys to decrypt communications intercepted illegally. Alternatively, a corrupt employee of an escrow agent might use the keys to engage in illegal wiretapping or sell the keys to a foreign government or to the mafia.

Clipper's key escrow system is being developed with extensive controls to protect against such threats. One fundamental safeguard is key secrecy. Keys and key components are generated in computers and are never displayed or printed out in forms readable by humans. In addition, they are always stored and transmitted in encrypted form.

Physical security is used extensively to protect sensitive material. The computer workstations at NIST and the Department of Treasury that are used for key escrow functions are used for nothing else and are kept in secured facilities. The chips are programmed with their IDs and device-unique keys in a vault designed for handling classified information.

As the Clipper system develops, keys are stored on floppy disks in double-locked safes and carried manually, wrapped in tamper-detecting packages, from the facility where the chips are programmed to the escrow agents and from the escrow agents to the law enforcement facility that is tapping the call. Ultimately, the keys will be transmitted electronically—in encrypted

form—between the chip-programming facility and escrow-agent workstations, and between those workstations and the law-enforcement decrypt processors. Separation of duties limits the power of a single person or agency. Different organizations operate the chip-programming

facility (so far, Mykotronx Inc. of Torrance, Calif., runs the only one), the key escrow services (NIST and the Department of the Treasury), and the decrypt processors (law enforcement agencies). Escrow officers are not allowed to program the chips, operate a decrypt processor, or even have a decrypt processor in their possession. Law-enforcement officers have access to a decrypt processor but not to keys (keys cannot be extracted from a decrypt processor). Escrow officers will attach a "self-destruct" date, corresponding to the end of the period of authorized surveillance, to keys transmitted to a decrypt processor. This measure precludes the use of keys after a wiretap order expires.

To limit the power of a single individual to abuse the system, the key escrow system requires that at least two people be present whenever a critical function is performed or when sensitive data might be exposed. In fact, because each chip's device-unique key is split into two components, and each component is held by a separate key escrow agent, it is not possible for one person to act independently. Neither component by itself reveals any information about the key; to reconstruct and use the key, both escrow agents must supply their parts. Further, within each escrow agency, it takes two escrow officers to unlock the safes that contain the key components. Similar two-person control systems have worked successfully in the military to control nuclear-launch codes and in the banking world.

Detailed procedures govern all operations that involve escrowed keys, including generation of the keys, programming of the chips, storage and release of escrowed keys, and government decryption. For example, a request for escrowed key components must include certification that the official is authorized to conduct the wiretap (normally established by a court order). All operations that involve the generation, release, or use of escrowed keys are logged. From the logs, it should be possible to determine that keys are used only as authorized, and only to decrypt communications intercepted during a period of authorized surveillance.

The key escrow system is undergoing independent validation and verification. In addition to paid contractors, four individuals, including myself, have been voluntarily reviewing the system as an extension of our earlier review of the Skipjack algorithm, on which Clipper is based. Based on what I have seen so far of the design, I conclude that there is no significant risk of an insider or outsider acquiring unauthorized access to keys.

As the Clipper system proves to be strong and resistant to abuse, the technology will, I believe, become



more widely accepted. The Department of Defense already uses Capstone—a more advanced chip that is built into a PC card named Fortezza—to provide security for electronic mail. Fortezza offers an attractive option for secure electronic commerce: it contains a mechanism for electronically “signing” a digital document so that the recipient can verify the sender’s identity. The American National Standards Institute (ANSI) is developing banking standards that could use Fortezza technology.

### WHO DO YOU TRUST?

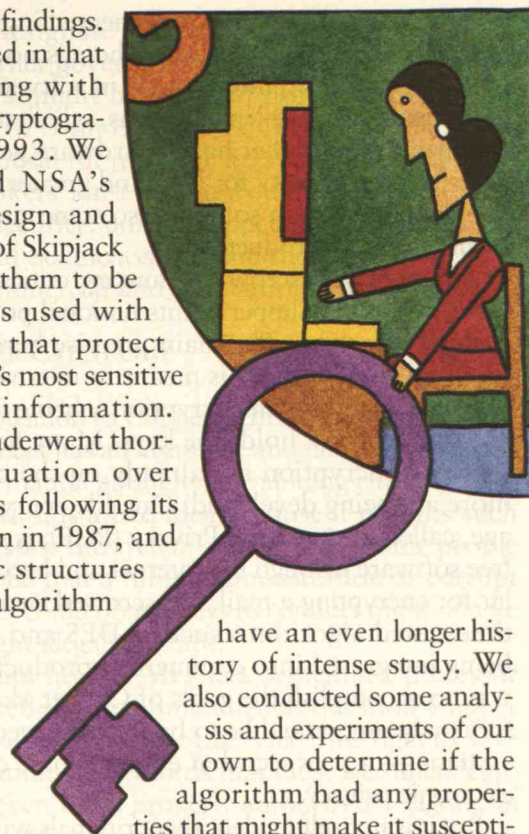
These safeguards have not eased everyone’s mind. One big concern is that the Skipjack encryption algorithm on which Clipper is based is classified. Because Skipjack is not open to public review, some people have questioned whether NSA might have intentionally sabotaged the algorithm with a trapdoor that would allow the government to decode encrypted communications while bypassing the escrow agents.

Critics also worry that this secret algorithm might harbor a design flaw that would leave it vulnerable to cracking. Such concerns have a legitimate base. Designing strong encryption algorithms is a difficult task. The only way to make sure that an algorithm is any good is to let many people analyze it and try to crack it over an extended period of time; many encryption schemes that appeared strong when first proposed later succumbed to attack.

A noteworthy example is the RSA algorithm, named after Ronald Rivest, Adi Shamir, and Len Adleman, all of whom were at MIT when they invented it in 1977. Breaking RSA requires the solution of a difficult mathematical problem: given a large number, what are the prime numbers that must be multiplied together to yield that number? A very simple example, with a low number, would be to find the prime factors of 1,261; a few minutes with a pocket calculator, or a trivial computer program, will reveal the answer: 13 and 97. But as the number to be factored increases in length, this task seems to get exponentially more difficult. When the algorithm was first introduced, Rivest predicted that it would take a quadrillion years to factor a 125-digit number using the fastest factoring methods then known. But factoring methods have advanced rapidly, and in 1994 a 129-digit number was factored in 8 months through the use of some 1,600 computers scattered around the world. RSA still appears to be very strong for numbers that are 200 digits or more.

To address the concerns about weaknesses and trapdoors in Skipjack, the government invited outside experts to independently review the algorithm and

report their findings. I participated in that review along with four other cryptographers in 1993. We examined NSA’s internal design and evaluation of Skipjack and found them to be the same as used with algorithms that protect the country’s most sensitive classified information. Skipjack underwent thorough evaluation over many years following its initial design in 1987, and the specific structures used in the algorithm



have an even longer history of intense study. We also conducted some analysis and experiments of our own to determine if the algorithm had any properties that might make it susceptible to attack. Based on our analysis and experiments, we concluded that there was no significant risk that Skipjack contained a trapdoor or could be broken.

Although publication of Skipjack would enable more people to confirm its strength, NSA is unlikely to do so; declassifying Skipjack would benefit foreign adversaries and allow the algorithm to be used without the key escrow features. Even if Skipjack were made public, it would probably be years before skeptics would accept its strength. When DES was introduced in 1975, it was similarly distrusted because of some NSA involvement even though the algorithm was developed by IBM and made public.

Still, Clipper’s use of a classified algorithm does limit its acceptability. There are many people who will never trust the NSA; for them, Clipper is tainted goods. In addition, many potential foreign buyers will not accept a classified algorithm or keys held by the U.S. government, although Mykotronx has reported that some potential foreign buyers are not concerned about these factors. Agreements might be reached that would allow some other governments to hold the keys or have access to the classified technology, but such agreements would likely be limited to a few countries.

Moreover, as long as the algorithm is supposed to



remain secret, it must be implemented in tamper-resistant hardware. That's because there is no known way of hiding classified information in software. This precludes software implementations, which are generally cheaper. On the other hand, hardware generally provides greater security for keys and greater integrity for the algorithms than software, so some customers will want hardware products.

Although key escrow is voluntary, critics say that the introduction of Clipper points national policy in a disturbing direction. The main premise here is that the criminals that Clipper is meant to uncover would be unlikely to choose an encryption scheme to which the U.S. government holds the keys. Many forms of unescrowed encryption are already on the market, and more are being developed. One file encryption package, called Pretty Good Privacy (PGP), is spreading as free software through the Internet and becoming popular for encrypting e-mail. Unescrowed encryption with time-tested algorithms such as DES and RSA is also being integrated into commercial products. The only way to accomplish the goals of Clipper, skeptics therefore maintain, would be to ban unescrowed encryption systems — a prospect that enrages some defenders of electronic privacy.

But it is not self-evident that criminals will shun Clipper. Whether they use the escrowed encryption system will depend in part on what else is available — and in particular what other forms of encryption are built into the most widely used commercial products. While PGP has a certain grassroots appeal, many organizations will be reluctant to trust their assets to software obtained over the Internet.

Over time, market forces could easily favor escrowed encryption. Some organizations might choose to use Clipper because the high quality of its encryption outweighs the slight risk that information will fall into the wrong hands. Vendors might favor key escrow because they will be able to build it into products that are exported. And the government's adoption of escrowed encryption will set a de facto standard; any company that needs to exchange encrypted information with federal agencies will need to use compatible encryption. If escrowed encryption becomes a business standard, many criminals will tend to use it — the convenience will outweigh the risk.

Even if criminals do not use Clipper, the government's voluntary initiative serves a useful purpose. If the government instead promoted strong encryption without key escrow, this would accelerate the spread of encryption that the government could not decrypt and the use of such encryption by criminals. The government

decided that it would not be responsible to use its own expertise and resources to pursue encryption standards that fundamentally subvert law enforcement and threaten public safety and national security.

#### ESCROW ALTERNATIVES

The basic concept of key escrow does not necessarily depend on handing the keys to government agencies. Private-sector organizations — licensed and bonded — could serve as key escrow agents instead. Although nongovernment escrow agents are unlikely to provide any greater protection than government ones operating under the controls stipulated for the Clipper system, they could be more widely accepted by those who are particularly concerned about government abuse. In addition, commercial escrow agents could make their services available to the private sector so that individuals and organizations could acquire their own keys for data recovery purposes. Clipper's key escrow system does not have this capability.

Some encryption products already have private key escrow capabilities whereby an organization can escrow its own keys. In addition, several companies and individuals have proposed commercial key escrow approaches, with third party agents. Some of these proposals, for example, one from Trusted Information Systems of Glenwood, Md., use software with unclassified algorithms. Commercial key escrow might achieve greater acceptability than Clipper and encourage the adoption of key escrow over unescrowed encryption. For that reason, the government has been working with industry to find alternatives to Clipper that might better meet the needs of industry and users.

For commercial key escrow to work, legislation may be required to deal with issues relating to liability and jurisdiction. What happens, for instance, if a state or local law enforcement agency needs keys held by an escrow agent located in another state? Normally, a warrant cannot be taken across state boundaries



except during federal investigations.

Another important question surrounding commercial key escrow is whether such systems will be exportable.

Companies that make encryption products would like to be able to manufacture a single product line for both domestic and international sales.

Moreover, the opening of an export market would help expand the market for key escrow encryption — indirectly, at least, lowering the chances that criminals will use unescrowed encryption. So far, the U.S. government has not said whether it would permit the export of commercial key escrow or software-based systems. At issue is whether the government is assured that it will have a way to decrypt information when it deems it necessary to do so.

An exportable encryption scheme would also facilitate an international encryption standard — an important goal, given that organizations often need to communicate securely with customers, suppliers, and partners outside the United States. So far, no international encryption standard provides end-to-end protection of confidentiality. DES is used worldwide, especially by the financial industry, but mainly for authenticating financial transactions rather than shrouding messages in secrecy. Many countries around the world have adopted a system called Glo-

bal System for Mobile to keep mobile radio communications secure. But GSM encrypts only the over-the-air link between a mobile phone and a base station. Communications that travel through wires and cables therefore remain vulnerable to interception.

Key escrow encryption offers the best hope for an international standard that would facilitate such international communications. In fact, an encryption method that does not provide a capability for government access is unlikely to be accepted as an international standard; other countries share the U.S. desire not to be left in the electronic lurch. Each coun-

try could designate its own escrow agents, which could be either government or commercial organizations. Users might have the option of choosing an escrow agent from this list. Bankers Trust has outlined a proposal for just such an approach. Like Clipper, the Bankers Trust system would use hardware for its greater security; unlike Clipper, however, the algorithm would be unclassified and therefore more suitable for commercial and international use.

### WILL CLIPPER CATCH ON?

Much opposition to Clipper stems from the belief that the government has an insatiable and unsavory desire to gather information about its law-abiding citizens. Clipper, say critics, is a bad idea because it permits such activity. Despite the system's safeguards, some people are concerned that a future administration or corrupt police officer could obtain keys to conduct questionable if not outright illegal wiretaps.

At a forum held at MIT last September, professor Rivest argued that the fundamental question Clipper raises is: Should American citizens have the right to have communications and records that the government cannot access even when properly authorized? A case can be made that from a constitutional standpoint, no such absolute right exists. The Fourth Amendment specifically protects against unreasonable searches and seizures while allowing those conducted with a court order.

While abuse of the Clipper system cannot be ruled out, it is unlikely. Neither the public nor Congress has tolerated such activity in the past, and federal wiretap laws, government regulations and procedures, and congressional committees have been established to protect against their occurrence in the future. Wiretaps are conducted under tight controls and subject to considerable oversight. Clipper includes an additional layer of protection since anyone wishing to conduct a wiretap must also acquire a special decrypt processor and keys from the escrow agents.

The opposition to Clipper makes its widespread adoption by no means assured. But escrowed encryption offers the best hope for reaping the benefits of encryption while minimizing its potential harm. Rejection of key escrow would have profound implications for criminal justice. As computer networks continue to expand into every area of society and commerce, court-ordered wiretaps and seizures of records could become tools of the past, and the information superhighway a safe haven for criminal activity. ■



# Eastern Europe: Putting Some Government Back in Manufacturing

BY ALICE H. AMSDEN

*In their haste to embrace an ideologically pure form of capitalism, leaders of formerly communist nations and their Western advisers have failed to provide firms with the help they desperately need to participate in the global economy.*



*Soon the fifth anniversary of Eastern Europe's historic transition to capitalism, restaurants and shops are booming in Poland, Hungary, Slovenia, and the Czech Republic. The clientele for this revitalized service sector consists of tourists and a new elite of entrepreneurs, managers, professionals, speculators, consultants, and crooks who have replaced the old Communist party bureaucrats. Unemployment is almost nil in Warsaw, Budapest, and Prague, and*

ILLUSTRATION BY FRANKLIN HAMMOND


life for the new propertied middle class has improved immeasurably over the bygone days of queues and suffocating government controls.

But outside the chic capital cities closest to Western Europe unemployment is reaching double-digit levels, as the manufacturing sector, consisting largely of state-owned enterprises (SOEs) that once monopolized the vast industrial landscape, stagnates and reels.

Early in the transition the World Bank and the International Monetary Fund (IMF) spent significant sums to commission world-renowned consulting companies to study SOEs. Some of the reports are highly informative, with one after another emphasizing poor product quality and outdated technology as problems the firms would have to overcome to hold their own against multinational firms at home and abroad. These studies concluded, for instance, that "improving the quality of products has to be a top priority item" in the pulp and paper industry; that the textile industry throughout the region needed time to boost the attractiveness of its fabrics; that leading Hungarian metalworking firms required foreign licenses to upgrade their production know-how; and that the Russian military-industrial complex had to retool if it hoped to make consumer electronics and other durable goods. Unfortunately, such studies were often not widely circulated or even consulted, and the East European, IMF, and World Bank economists responsible for devising policies targeted to SOEs have had no hands-on knowledge of functioning companies. Not surprisingly, those policies have been largely inappropriate.

In 1991-92, I was fortunate to have undertaken my own field study of 20 state-owned enterprises in Hungary and Poland for the Paris-based Organization for Economic Cooperation and Development (OECD), as part of an investigation of East European industrial competence. My initial reaction was surprise at how poorly run and uncompetitive some SOEs were, but also at how inherently viable were others in a wide array of industries. But first these promising firms would clearly need help—at least some of it from gov-

ernment—in upscaling their product lines, upgrading their production processes, and strengthening their managerial abilities, especially in the areas of finance and marketing. Such help has not arrived.



## Flawed Strategy

The winds of change in Eastern Europe swept to power a new economic elite that favored the opposite extreme of central planning and state ownership—swift privatization of all sectors of the economy at any cost (partly as a way for this group to itself acquire property). To make state-owned firms more enticing to potential buyers, especially foreign industrialists, governments imposed wage controls on employees of SOEs. Private investors were expected to be hard-nosed enough to fire excess employees and further cut wages, thereby making these firms profitable. The overall idea was that Eastern Europe would specialize in exports that depended on cheap labor and abundant raw materials.

The World Bank and IMF, too, emphasized the necessity of selling state-owned enterprises as quickly as possible by effectively barring East European governments from providing SOEs with financial backing for modernization. For example, the Bank and IMF prevented governments from establishing development banks to lend to promising enterprises at favorable interest rates. And while they helped finance ministries of privatization, the IMF and the Bank discouraged governments from rehabilitating ministries of industry that could champion the cause of modernization while SOEs looked for foreign buyers.

Unfortunately, the result of this hasty and ill-conceived strategy was that foreign buyers with a willingness to invest long-term in East European industry were few and far between, and domestic buyers were scarcer still. Figures for 1994 show that privatization—defined as a sale of public assets in exchange for capital or technology—has stalled throughout the region. Robert Parker of Harvard's Kennedy School of Government has found that Hungary sold off barely 200 of its 2,000 state-owned firms to private investors while Poland sold no more than 1,000 of 8,000. Romania planned to privatize 1,100 large companies in 1993 but sold only 10. The privatizations that do occur often take a form

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frowned upon by international advisers: workers and managers borrow government money to purchase individual factories. The advisers fear that these small and medium-sized enterprises will not be viable because the owners will simply raise their own wages or recreate a socialist economy.

Not only have foreign investors been slow to buy industrial assets in Eastern Europe but they have also hesitated to set up their own manufacturing facilities in the region. Overall, international investment in these countries has fallen far short of advisers' original expectations. And over half the foreign investment the region has attracted has gone to one country, Hungary, because of its proximity to the West, relative political stability, and skilled—rather than cheap—labor.

Part of the problem is that the view that cutting labor costs would attract foreign investors or make SOEs internationally competitive was simply off the mark. These enterprises certainly employed more workers than they needed for efficient production, but wages already accounted for a very low share of total costs. Even in Poland, which had one of the strongest trade union movements in Eastern Europe, wages averaged only 15 percent of a typical firm's costs. That's because under the former communist regimes, much of workers' income took the form of government subsidies to rent, fuel, transportation, and food, all of which relieved firms of the burden of paying a living wage. Gearing restructuring policies toward reducing employment levels and already rock-bottom wages has therefore not significantly enhanced SOEs' international viability because the real problems are outdated technology and poor product quality.

When private investors failed to buy state properties, foreign advisers devised alternative arrangements whereby public assets would be distributed free or almost free to adult citizens. For instance, a large proportion of state property in Russia and the Czech Republic has been given to the public under a coupon program that facilitates mass privatization. Official



**The view that cutting labor costs would attract foreign investors and make state-owned enterprises internationally competitive was simply off the mark.**

Russian statistics indicate that by the end of 1993, roughly 7,500 industrial enterprises—or about 35 percent of the total—had “sold” shares to the public, making one-third of the population stockholders. Unfortunately, such transactions provide only the illusion of privatization because public “owners” do not supply the money or technology that firms need to modernize.

The situation became grave when government ministers and their advisers decided to apply “shock therapy” and remove price controls on food and other goods in one fell swoop. Inflation raged and eroded real living standards, steeply cutting demand for consumer products and causing output—and employment—to plummet. As incomes declined, the number of bankruptcies and level of political instability rose.

Because SOEs were once the major source of tax revenues for their states, lower profitability has meant large budget deficits and a vicious cycle of cutbacks in public spending, further declines in consumer demand, more reductions in industrial output and thus state revenue, and still greater cutbacks. What's more, by failing to modernize to boost exports, the countries of Eastern Europe have found it difficult to obtain the hard currency they need to buy the capital goods and technology to further reengineer their economies.

## **C**ircumventing Official Policy

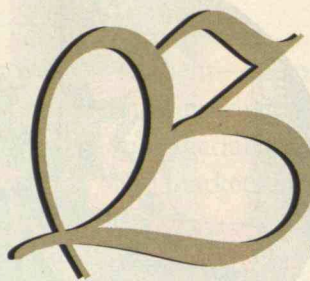
Today, given the failure of state-owned firms in Eastern Europe to attract investment and to be restructured, the mystery is not why industrial performance has been so disappointing but why it has stopped short of total disaster. An explanation lies in the fact that the stereotype of the supine state-owned enterprise has proven untrue in many cases.

Despite their reputation for inertia, corruption, incompetence, and shortsightedness, state-owned firms

that have survived have taken whatever steps they could to reform. These firms have tried to streamline their product lines, update production, improve quality control, introduce modern cost accounting, and, most of all, search for new markets. For instance, the Old Lenin Shipyard in Gdansk, Poland, home of the Solidarity Trade Union, sent managers all over the world in search of new orders, in contrast to the complacency of a newer shipyard down the road in Gdynia, which nearly went bankrupt in the expectation of being quickly privatized. SOEs have also tried to trim their costs by selling many of the service facilities they had previously maintained for their workers, including vacation facilities, lunch cafeterias, child care centers, and, as a last resort, health care clinics, as well as other unnecessary buildings and other fixed assets (although the firms were not always allowed to keep the financial returns).

Economic collapse has further been averted because not all the subsidies of the former regimes have been abolished. For instance, the Czech Republic, which is overtly orthodox in its free-market philosophy, still covertly subsidizes some combination of citizens' rent and fuel and supports a public transportation system. The growing numbers of unemployed and underemployed could not subsist without these interventions. Moreover, just as controlled markets before the transition bred an underground economy that greased an unworkable system's wheels, the opposite extreme of uncontrolled markets after the transition has spawned another unofficial economy, tolerated but not publicly acknowledged by authorities. Unemployed citizens are believed to take advantage of nontaxable income-earning opportunities by working as waitresses and artisans, for example.

At the level of the individual firm, the state-controlled Czech banking sector provides an important subsidy by extending the payback period for loans that SOEs use to pay their workforces and buy raw materials. The government has also not closed SOEs that are technically bankrupt and therefore behind on tax payments because these firms provide one of the few opportunities for employing redundant workers and idle capital equipment. Governments further see the need to keep these enterprises in business because, despite their problems, SOEs are still the major exporters in most countries.



## itting the Bullet on a Larger Government Role

Of course, Eastern Europe's transition to capitalism has been unusual, so it is not surprising that leaders and their advisers have committed serious policy errors along the way. But the margin of error might have been substantially reduced if these policymakers had taken their cues less from abstract models and more from poor postwar countries that successfully industrialized under at least somewhat comparable conditions—with unlimited labor supplies but lacking the proprietary technology and world-class products that, by contrast, enabled U.S. industry to capture international markets with little effort on the part of government.

Experiences in East Asia and Latin America should specifically have warned leaders not to expect too much from foreign investors. These investors typically do not act as catalysts but rather arrive only *after* an economy has picked up momentum and a country has achieved political stability. Even when they do come, foreign firms and private banks tend to provide only a small fraction of total investment in new industrial equipment, except in countries with large domestic or strategic export markets (such as Mexico, with its proximity to the United States) or rich natural resources (such as Malaysia).

Thus, while privatization remains a long-term goal in Eastern Europe, foreign advisers will have to accept that the magic of the market is insufficient to modernize state-owned enterprises. In particular, the World Bank and IMF will have to allow the kind of active government intervention that they now prohibit as a condition of awarding their loans.

One problem that needs government attention is firm size: although the region's communist legacy is notorious for having formed enterprises that are too large, or at least too rigidly bureaucratic, many are in fact too small. A 1991 U.N. report maintains that "the steel industries of Eastern Europe face certain common problems. These include out-of-date and *undersized* plants." Creating internationally viable companies in fragmented industries such as steel, paper, and detergents will require closing some plants and merging others. In theory a private bank or other institution might best achieve such industrywide rationalization. In practice governments will have to begin this task because

private banks are less interested in restructuring basic industry than in lending to pizza parlors and other ventures expected to yield quick profits, especially during a time of political instability.

While economic development is never easy, it's admittedly trickier when a country's leading firms lack their own competitive technology. Yet the rapidly growing economies of East Asia show how government subsidies such as low-cost credit and incentives to export can be used to great advantage, while slower-growing late industrializers provide warnings of what to avoid. In stagnating economies such as India and Argentina, subsidies have been allocated to firms as giveaways. In much of East Asia, including Japan, South Korea, and Taiwan, subsidies are awarded according to the principle of reciprocity—nothing is given away to business for free, or forever. To qualify, firms must meet concrete, time-dependent performance standards such as export targets, quality standards, and long-run productivity goals, monitored by well-trained state employees. For instance, to obtain hard currency to pay for expensive oil after the 1973 energy crisis, Thailand's Board of Investment made subsidies to textile companies contingent on their ability to export at least 50 percent of their output (the board withdrew aid from one in ten clients for noncompliance). South Korea protected infant industries from imports on the condition that firms use their profits to upgrade products for foreign markets. And the Taiwan government awards low-cost credit to companies as long as they invest in environmental protection and research and development.

Reciprocity is not only key to the success of restructuring in Eastern Europe but would differentiate future government support to business from that of the past. During the first five years of post-communist transition, subsidies have been allocated under the table to state-owned firms without either performance standards or monitoring. Bringing support into the open promises to discipline business and government alike. To accomplish this end, Eastern Europe will have to create a small, elite bureaucracy at least equal in calibre to the privatization



**East European policymakers should have taken their cues less from abstract models and more from poor postwar countries that have modernized under somewhat comparable conditions.**

and finance ministries established with IMF and World Bank support.

To determine which SOEs are most likely to advance national economic development, and thus are most deserving of scarce government funds, officials at the new agencies can hold contests to evaluate firms' business plans and competitive strategies. The SOEs themselves should specify the types of performance standards they can fulfill in return, such as devoting a certain percentage of their output to a particular product line (say, computer-controlled machine tools or specialty steels), meeting a quality level by a specified year, or

exporting given quantities of goods to selected countries. The bureaucracy must credibly threaten to withdraw subsidies if firms do not meet these goals.

Earlier Eastern European efforts to rank the best firms for privatization show that this process of "picking winners" is feasible, especially since, rather than attempting to anticipate new markets at the highly uncertain world technological frontier, these governments will be choosing among firms striving to compete in known markets with products that already largely exist. The high educational levels in Eastern Europe give further confidence that employees of modernization agencies would have the savvy to select the best enterprises.

For a successful model for such policies, the region can look to Thailand, where postwar industrial growth rates have averaged 9.5 percent annually. To avoid under-the-table deals, the Board of Investment, composed of top ministers, chooses candidates for tax relief in open meetings.

Foreign advisers have an important role to play in encouraging this kind of activity, or at least in agreeing to allow it. The transition in Eastern Europe has arguably been more difficult than expected and more dismal than necessary because of these advisers' ill-conceived policies toward state-owned firms. Unless they learn more about this form of business enterprise and help modernize its best representatives, the region's state-owned industrial sector will continue to ail, as will the fragile small and medium-sized private manufacturing enterprises that critically depend on it. ■

## Green Heat

IN television and magazine ads, glossy reports, and press conferences, business leaders have been propagating the message that they understand and care deeply about the environment. But if corporations hoped that this publicly stated concern for the environmental consequences of their activities would ease some of the pressure to improve their environmental performance, it appears that they miscalculated.

Starting during the Bush administration, enforcement activity by the U.S. Environmental Protection Agency, the Department of Justice, and state regulators has been ramping up; in more and more cases, companies are being criminally prosecuted or made to sign consent decrees that require specific, and often costly, remedial actions. Even though the new Republican leaders in Congress have strongly criticized environmental regulation, the pressures on business are unlikely to abate any time soon.

The bipartisan U.S. Sentencing Commission, for example, has proposed new, stricter guidelines for punishing environmental violations. These rules allow courts to take into account when assessing a fine the extent to which managers monitor compliance. Fines can be reduced if the company has put in place incentive programs to reward behavior that favors the environment.

Regulations aside, companies are also feeling stronger pressure to improve environmental performance from constituencies that are more traditionally respected in the business world: investors and customers. During the 1995 annual meeting season, investors in 22 companies are expected to vote on shareholder proposals related to improving their environmental performance and reporting. At a number of these companies, shareholders will be pushing for adherence to a 10-point environmental code of conduct formulated by the Coalition for Environmentally Responsible Economies. The effort to institute these principles has been sponsored by an alliance of environmental,



*Business is painting itself as environmentally friendly.  
No wonder, considering the pressures at work.*

religious, and investor institutions; it has gained momentum over the last two years with endorsement by several *Fortune* 500 companies, including Sun Co., General Motors, Polaroid, Arizona Public Service, and H.B. Fuller.

Similarly, some of the institutional investors that supply much of the capital for U.S. industry are feeling a pull from their constituents to make their portfolios greener. Several major financial institutions—including TIAA-CREF, the country's largest private pension fund and insurance company, with \$135 billion in assets—have started investment funds that use environmental performance as one criterion for selecting stocks.

While most such institutions show no desire to see the environment become a political cause célèbre, as disinvestment in South Africa became in the 1980s, some action is beginning to occur. In 1992, Dartmouth College divested its bond holdings in Hydro-Quebec, a major Canadian electric utility, follow-

ing student protests and a petition drive on campus criticizing the impacts of the utility's massive Great Whale hydroelectric project on native lands in northern Quebec. Tufts University and Williams College followed suit in 1994, each after enduring almost two years of student pressure to divest. The Quebec provincial government announced late last year that it was putting the project "on ice for a good long while."

New rules that force companies to disclose more information about the cost of their environmental cleanups provide another incentive for a company to behave responsibly. A survey published in 1993 by the accounting firm Price Waterhouse found that only 62 percent of companies with known environmental liabilities had reported them in their financial statements. To end such concealment, both the Securities and Exchange Commission and the Financial Accounting Standards Board have recently issued new standards requiring companies to disclose more detailed esti-

mates for what it will cost to deal with significant environmental liabilities such as cleaning up waste sites. The new regulations also require companies to set up reserves to pay for these future costs, which can be considerable; corporate liabilities for the cleanup of abandoned Superfund hazardous waste sites alone will range from \$42–120 billion in present-worth dollars, according to the Congressional Budget Office. Presumably, a company that will have to bare to its hard-nosed stockholders how much money it is spending on cleanup will be more careful about incurring such liabilities in the future.

Yet another new source of pressure on companies comes in the form of procurement practices. Many federal contracts now contain clauses requiring contractors to investigate and monitor the environmental performance of subcontractors and vendors. Some companies have adopted such practices on their own, without a federal mandate. AT&T policy, for example, instructs employees to "include environmental considerations among the criteria by which projects, products, processes and purchases are made." Many other large manufacturers have followed suit and are developing criteria for selecting environmentally responsible suppliers and standards to which they must adhere.

Perhaps the greatest pull on companies comes not from any external pressure but from straightforward economics—it is cheaper to prevent pollution at the source than to clean it up at the end of the pipe and then to settle litigation with the victims of environmental hazards. 3M claims to have saved a whopping \$646 million since it instituted its Pollution Prevention Pays program in 1975.

### Closing the Loop

Although these first steps toward treating pollution as an economic variable to be measured and managed are promising, they will not be enough to achieve a sustainable world economy. To make real progress, companies—or, more

likely, consortiums of companies—must close the loop in their production processes, turning wastes and used products into production inputs.

While economic incentives to do this already exist, government regulation might also help. A good model is Germany, which is already the world leader in tough "product takeback" regulations. These rules obligate manufacturers in some industries to accept old and worn-out products from customers and recycle the recovered materials into new products. Governments could also move much further to internalize the costs of pollution and environmental degradation—that is, to make polluters pay for the social and global costs of their actions. Such efforts must be coordinated internationally to avoid creating incentives for companies to outsource production to countries with lower standards.

One approach to internalizing environmental costs would entail taxing products based on the extent to which their manufacture depletes or degrades natural resources; thus a bicycle would be taxed at a lower rate than a car, for instance. While such a policy is unlikely to find approval in the United States anytime soon, other countries are moving in this direction. In Germany, for example, the environment minister, Klaus Topfer, is considering a national tax on disposable dishes, cups, plastic cutlery, and other take-out food containers after a federal court in Berlin upheld a similar special tax levied in 1992 by the city of Kassel. Such a surcharge could add as much as 25 percent to the cost of a typical fast-food meal served on disposable dishes.

Right now, sustainable development is still something of an oxymoron. But the potential exists to make the closed-loop way of thinking the linchpin of a new world economic and technological order. ■

*SCOTT A. FENN is director of the environmental information program at the Investor Responsibility Research Center in Washington.*



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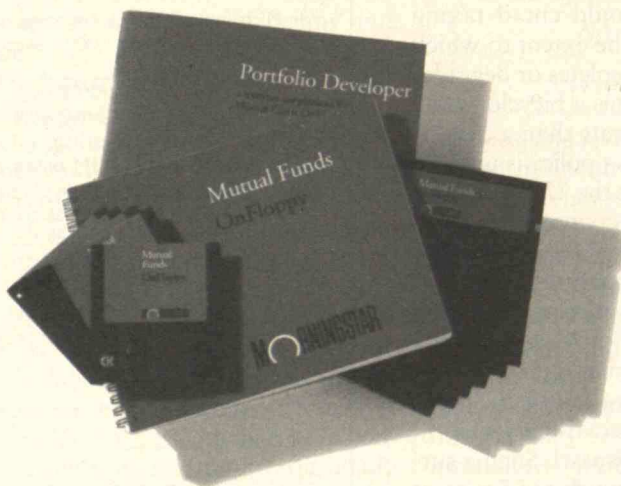
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# The Serendipitous Engineer

**W**Henever I visit the campus of an engineering school, some earnest undergraduate is sure to ask me questions about how best to embark on a career. There is, of course, uneasiness about the job market that is specific to this moment in history. But beyond such anxiety lie uncertainties that have troubled students in every generation. Inevitably they wonder: Once I become a professional engineer, how do I make the most of it?

It is difficult not to answer in platitudes, which are, after all, the residue of truth. Here is the advice I give.

Firstly, know thyself. Young engineers do not, by any means, all have the same aspirations. To many, the opportunity to do exciting technical work is a top priority. To others, job security has great appeal. There are idealists who want to help save the world and materialists who dream mainly of large incomes. A few have entrepreneurial ambitions. The list of hopes and dreams is endless: teaching or government service; freewheeling independence or position in a reputable corporation; pressure or serenity; a job near home or travel to exotic places. A goal, however nebulous, provides a valuable inner compass.

I usually advise taking chances when one is young. There is time enough for caution when family responsibilities begin to accumulate or the fires of energy burn a little less brightly. I counsel patience: do not expect the first days of employment to be blissful. On the other hand, I often quote Charles Steinmetz, the brilliant electrical engineer of an earlier age, who said that young engineers who find themselves in dead-end jobs should seek to escape, just as a drowning person will seek the surface of the water "to get the blessed air."

Inevitably the student will ask about my personal experience, and this gives me the chance to switch the conversation from planning to serendipity. For it is my strong belief that luck, timing, and pure happenstance are likely to be critical in the pursuit of a career. Engineers should expect this and be prepared to make the most of these attributes. I do

not recommend a readiness to give up on one's dreams; rather being flexible, imaginative, and willing to consider alternate routes to the happy land.

When I first studied structural design, I thought that I had found my life's calling; but this was not to be. I completed my engineering studies in the Navy, and at the end of World War II, found myself helping rebuild military facilities on various Pacific islands. Presto, I became a construction engineer instead of a designer. Upon returning to civilian life, unappeased wanderlust led me to a surveying job in South America, after which I resolved to forever spend my working days out of doors, "in the field." However, upon returning home, the best available opportunity was as an office engineer doing estimating and project management. Weighing the alternatives, I traded in my transit for a pencil, a calculating machine, and a telephone. This

found my professional utopia.

I would guess that my career path is not more erratic than that of most engineers, particularly in recent times. The technological world is more mercurial than it has ever been. Companies come and go, and products flourish only to become outmoded. World events affect technical priorities, with unsettling consequences for specialists in aerospace, nuclear power, and many other disciplines. Happily, engineers, unlike dinosaurs and other extinct species, are infinitely adaptable.

As the archetype of the serendipitous engineer, I submit the example of a young man I know who majored in petroleum engineering, thinking that one day he would uncover new energy sources under deserts or ocean floors. Upon graduation he had trouble finding work in the oil industry. But opportunity came from a new and totally unantic-



decision worked out wonderfully well, except for one little problem: unbeknownst to me, the venerable company I joined—builder of many of New York's most outstanding landmarks—had for some time been experiencing financial difficulties. As I rose in the ranks, the firm descended toward insolvency.

Eventually, I encountered two young men who had just started a contracting business in Westchester County, a half-hour "reverse commute" from my home in Manhattan. At that very moment—timing is all—they needed what I had willy-nilly become: an estimator/project manager with field experience. I threw in my lot with this new enterprise and

pated, but not unrelated, quarter. Today he is very successful—and professionally fulfilled—analyzing and remediating soil under and around abandoned gasoline stations.

This is the sort of future I try to project before young engineers. Make plans, to be sure, and things may work out exactly the way you anticipate. But if they don't—and they probably won't—be thankful for the diversity that is characteristic of your profession. ■

*SAMUEL C. FLORMAN, a civil engineer, is the author of Engineering and the Liberal Arts, The Existential Pleasures of Engineering, Blaming Technology, and The Civilized Engineer.*

## Sometimes, Washington *Does* Know Best

As the federal role in economic development comes under attack, the country is in for a wave of experimentation by—and therefore heightened variation among—state and local governments. Yet as we proceed down this politically popular path, we should remind ourselves why the federal government became active in economic development in the first place.

Beyond the financial and intellectual resources that it brings to the table, our national government has historically been more responsive than states, municipalities, and corporations to the special needs of distressed areas and forgotten workers. Over the last 30 years, federal agencies have changed the complexion of American business by mandating, for example, that federal contractors set aside a certain share of their business for minority- and women-owned companies, and by providing grants, low-interest loans, and technical assistance programs to such companies.

Moreover, the federal government tends to have a longer time horizon than state and local governments can generally afford. Physical infrastructure is crucial to an area's economic development. When local governments have to finance a bridge repair, say, or the laying of fiberoptic cable, they often have to float bonds that require them to start paying interest to bondholders right away. But some projects—like Boston's "Big Dig" highway and harbor upgrade—may take 20 years to complete and begin to offer local economic benefits. Only the feds have the resources to authorize grants commensurate with the longer time frame. The federal government can be shortsighted too at times (Congress is now slashing funds for the Boston Harbor), but in comparison to subfederal governments, Washington sets its sights for the long haul.

Local jurisdictions also tend not to see the importance of collective approaches to development, such as the creation of regional technology centers that aim primarily to upgrade small- and medium-sized manufacturers. And localities that do understand the value of new institu-

tions may be unable to mount such an effort at an efficient scale, or to coordinate centers that cross city and state jurisdictional lines; it has proved nearly impossible for states to cooperate across their borders, for example, because each governor wants credit for initiating a new center or economic development project. The temptation is for every state to have at least one, sometimes several technology transfer/R&D programs, leading to wasteful duplication.

Ohio, for instance, established an excellent center in Cleveland for developing and disseminating metals and machining technology. Logically, this center should also serve small manufacturers in neighboring Pennsylvania, given the historic linkages between the two regions (most of Pittsburgh's steel-making equipment has for years been built by companies in eastern Ohio). But Pittsburgh officials wanted their own center, so one was

national government at the policy table focuses attention on the need for positive-sum strategies.

The Democrats have proposed consolidating federal economic development efforts into a single public corporation. This entity, working with state and local governments and with the private sector, would choose local recipients of grants and loans. The Republicans would instead roll federal programs into a block grant to the states, simultaneously cutting the funding level substantially (the Democrats also project savings for their approach, achieved largely by consolidating agencies).

The debate that will ensue over the outcome of these proposals should reenergize policymakers for the new rounds of initiatives that will of course be mounted in the years ahead. For despite the fashionable antigovernment rhetoric, no business community in the world



created anyway. Eventually, the National Institute of Standards and Technology stepped in to create a federally coordinated program of manufacturing technology centers and encouraged companies and local governments to participate in the nearest appropriate center.

Finally, federal actors tend to be attentive to the danger that local development officials will turn economic development into a zero-sum game. Some states and regions concentrate their economic development efforts on recruiting successful companies to relocate from another area—a tactic that provides local benefit but makes no net addition to the country's productive capacity. Having the

could stay afloat without the active support of institutions, funding, and standards built and enforced by the public sector. One only hopes that, in the process of redesigning economic development policy more extensively than at any time since the 1930s, and in celebrating what has come to be called "devolution" of responsibilities, the players keep in mind those things that the national government intrinsically does better than anyone else. ■

*BENNETT HARRISON is professor of political economy at Carnegie Mellon University, presently on leave as a visitor to Harvard's John F. Kennedy School of Government.*

# Reviews

## BOOKS

### FINANCES IN CYBERSPACE

*A Piece of the Action:  
How the Middle Class Joined the Money Class*  
by Joseph Nocera  
Simon & Schuster, \$25.00

BY STEPHEN D. SOLOMON

CREDIT cards and mutual funds, discount brokerages and cash management accounts—now that the capabilities of the microprocessor have married the inventiveness of Wall Street, personal finance has entered a new era. “When one recalls what the financial life of the middle class was like 20 years ago—when thrift was the highest virtue, when the daily movement of the Dow Jones average had almost no relevance to our lives, when few of us knew what a mutual fund was, much less the distinction between, say, a growth fund and a balanced fund—it’s hard not to conclude that this transformation has, indeed, been revolutionary,” writes business journalist Joseph Nocera in *A Piece of the Action: How the Middle Class Joined the Money Class*. As he points out, past generations could not benefit from sophisticated financial instruments without a nest egg of six figures; for most Americans, bank savings accounts and no-interest checking accounts comprised the family investment vehicles.

But then in 1974 Fidelity Investments invented the money market fund with check-writing privileges, thereby allowing middle-class consumers to bypass the banks and enjoy yields previously known only to the wealthy. Next came thousands of mutual funds that enabled small investors to pool their money to buy stocks and bonds. And in the 1980s the use of credit cards skyrocketed. By 1994 the average American carried 9.5 pieces of plastic and owed more than \$2,700 in credit card debt—debt that



had been obtained without so much as a handshake.

Nocera suggests that technology has been the linchpin of the financial revolution, but not simply because it means less accounting has to be done by hand. “Computers weren’t important only because they managed highly complex tasks; they were important because they *disguised* highly complex tasks,” he notes. “By making a complicated process invisible, computers allowed people to forget about the complexity, and focus instead on what was visible: namely, how easy the thing was to use.” When you buy something with a credit card, for instance, the transaction occurs seemingly instantaneously through a worldwide network of computers that searches databases, approves requests, and records the appropriate information so that a variety of banks can be credited their fees and you can receive the proper billing at the end of the month.

This achievement—creating tools that are both smart and easy to use—is a major one. And lest anyone shrug at it, consider the struggles of the personal computer industry over the last 15 years to accomplish the same thing. People who cringe at the thought of booting up a PC tap into financial technology every day without even thinking about it.

### Redefining Customer Service

Nocera presents a history of the money revolution, focusing on the cast of characters who made it all happen. Among them are Dee Ward Hock, the visionary who made Visa into the biggest credit card company in the world, and Peter Lynch, the Babe Ruth of investors whose Fidelity Magellan Fund brought big stock market gains to hundreds of thousands of average American families.

But the most instructive story may be that of Edward C. Johnson 3rd, the taciturn innovator who took over Fidelity Investments when it was a modest family business and turned it into the largest U.S. mutual funds company. For Johnson, technology was almost a religion. “His chief passion,” writes Nocera, “seemed to be computers: the installation, maintenance, and use of the giant mainframes that would be the backbone of the company in the 1980s was what most engaged him, and he was constantly in the computer room, watching, asking questions, tinkering with the machines. Naturally, his staff thought he was pouring too much money into computer capacity, and viewed his obsession as folly. Naturally, they would be proved wrong as soon as the bull market began.”

Unlike the established firms like Merrill Lynch and Dean Witter, Fidelity rarely talked to its customers in person; to bring Wall Street to the millions of new investors on Main Street, Johnson opened massive phone centers and asked customers to send checks to a post office drop. It was a new way of doing business—less expensive than setting up brokerage offices throughout the country and perfectly suited to capturing a commanding share of middle class investors.

“The concept of ‘customer service’ had less to do with talking to someone face to face than it did with having phone calls answered promptly, statements delivered accurately, business conducted efficiently,” Nocera explains. Johnson “understood that people would judge the company on the basis of technology they never saw and were only dimly aware of.”

# Sometimes, Washington Does Know Best

Charles Schwab, the entrepreneur who shook the starched shirts on Wall Street by building a chain of storefront discount brokerage offices, also relied heavily on advanced technology. Yet he used it less wisely, making mistakes that almost sunk him. In 1980, he cancelled a public offering of stock after investors read the company's prospectus, which revealed an error rate on trades that reached as high as 10.5 percent (a typical competitor made errors at a rate of 1.4 percent). Schwab blamed the company's woes on problems with its computer system.

Nor was Schwab as astute as Johnson in preparing for the volume of business that would come his way, which created serious problems during the stock market crash of 1987. The company's computers were overwhelmed by 8:00 a.m. on Black Monday as thou-

sands of sell orders swamped the company; many investors got a perpetual busy signal. "By Wednesday," writes Nocera, "the entire computer system had shut down, and Schwab was reduced to running apologies in California newspapers." Most other firms were in the same position. But at Fidelity, where Johnson had invested wisely in extra capacity, investors got through, even if they sometimes had to wait.

Perhaps the most interesting individual Nocera profiles is Andrew Kahr, a mathematics PhD from MIT who devised some of the financial industry's more ingenious tools. Kahr, who entered Harvard at 14 and bore a resemblance to entertainer Tiny Tim, possessed a rare ability to meld concepts from technology, business, and finance. His chief contribution may have been the cash management account he developed for Merrill Lynch—it combined a number of products traditionally offered by different segments of the financial world, including a stock and bond portfolio, a money market fund with checkwriting privileges, and a credit/debit card. Merrill Lynch's cash management account "was a device that crossed once-uncrossable barriers," writes Nocera. Other financial institutions soon mimicked it.

Despite the success stories Nocera offers, not all tales from the money revolution have a happy ending. Recessions fill the bankruptcy courts with consumers to whom credit cards represent a fatal attraction. Scam artists working from boiler rooms hook people with promises impossible to keep. And some financial institutions find out that they can't control a rogue trader. For example, Barings P.L.C., the 233-year-old British investment banking firm, collapsed in March following a loss of more than a billion dollars, incurred when one of its traders in Singapore took huge risks in trading complex securities called derivatives.

Even so, the book helps illuminate one of the major changes in contemporary American culture during the past generation. And that change appears to be permanent: the money revolution is moving at a faster pace than ever. Later

this year, Visa will introduce a new plastic card with a microchip that will store money in electronic form; it could replace cash for many minor purchases. And companies large and small are developing interactive financial services to be offered through the Internet or cable or telephone lines. Now that the vast middle class has joined the money class, huge new markets await—at least for the smartest innovators. ■

STEPHEN D. SOLOMON, an associate professor of journalism and mass communication at New York University, has served on the editorial staffs of both Inc. and Fortune.

## BOOKS

## COMPUTERS' ROLE IN ART

*Digital Mantras: The Languages of Abstract and Virtual Worlds*

by Steven R. Holtzman  
MIT Press, \$29.95

BY ROB HENN

TECHNOLOGY has always affected art in profound ways. In the Western tradition, Gutenberg's printing press irrevocably changed literature and music from isolated activities into marketable products that could be disseminated across Europe. The introduction of photography during the Industrial Revolution posed new challenges to visual artists, while valves made brass instruments more expressive and delicate keys did the same for woodwind instruments. In our own century, film, video, and audio recording technology have made new art forms possible, and more recently computers have come to play an important role in art. A new generation writes and reshapes its paragraphs with word processors; creates, stores, and

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manipulates its visual images as digital arrays; and composes its music using desktop hardware and software.

Steven R. Holtzman's *Digital Mantras: The Languages of Abstract and Virtual Worlds* attempts to formulate an aesthetic for the age of digital technology—that is, a way in which we might revise our conception of art in response to new, digital methods of production. In doing so we need to determine how digital art fits into the history of art as a whole, and Holtzman believes the key to doing this lies in the realization that computers are “manipulators of abstract structures.”

Going back to the early part of the twentieth century, Holtzman thus focuses on artists who employed abstraction and formal structure in their work. The composer Arnold Schoenberg, for example, figures prominently in *Digital Mantras*. He, like other composers of his generation, felt that “diatonic tonality,” the language dominant in nearly all Western music, was no longer adequate for expressing emotions, and starting in the 1920s, attempted to supplant that language with a method later called twelve-tone composition, in which composers based their works on a set of 12 different notes they chose and ordered themselves.

These “tone rows” could be deployed in any number of ways so long as their order was kept. The resulting music was logically organized and formal, even if to casual listeners it sounded senseless and random. Schoenberg was in this sense, as he realized and said, firmly part of a tradition that admires well-defined form.

Using binary switches to manipulate complex structures, the computer lends itself well to formalism and is thus well suited to Schoenberg's artistic descendants. But Holtzman is not content to simply make this point. He goes on to argue that digital art, which he apparently assumes must be highly formal and abstract, can lead to a discovery of the “fundamental vibrations of the universe” in the tradition of such ancient scriptures as the Rig Veda. Specifically, he considers it an advantage that computers lack contact with human life



unless fed this information in digital form. As he explains, representation, the habit of referring to things and events in the world, is to be avoided as a distraction to understanding Brahman, “that which fills all space and time.”

#### Form versus Chaos

In making such statements, Holtzman draws on diverse sources, not only ancient Eastern mysticism but also twentieth-century visual art, Enlightenment philosophy, and twentieth-century linguistics. Yet despite this inclusiveness, he takes no heed of that other tradition in Western art—the one that typically seeks to deny classifiable form.

For example, many artists and thinkers since Schoenberg's time, loosely grouped under the banner of “postmodernism,” assert that excessively rigid forms in art may fail to accommodate the sheer variability of human experience and thus preclude insights and interpretations. Postmodernists also reject the pursuit of abstraction, affirming that art, even if it is not representational, is nevertheless always part of the “real world,” since that is where its audience is. Art, they charge, never exists in a purified realm devoid of human interpretation and involvement.

Consider the postmodernist composer John Cage. Once a student of Schoenberg's, Cage eventually posed a direct challenge to him, producing works that used “aleatoric,” or chance-based, processes. The most (in)famous example is Cage's 4'33”, in which the audience listens, for four minutes and thirty-three seconds, to any and all sounds that happen to be present in the room. Whatever else one might say about such a piece, it is certainly not highly structured. Nor is it divorced from material reality.

But although Cage and other postmodernists are mentioned appreciatively in *Digital Mantras*, their ideas are never discussed in any depth. Such evasions make the book frustrating. For while the computer can indeed help create and manipulate structures, it can just as easily disrupt them: random-number generators have already been used in the music of postmodernist Iannis Xenakis, another composer Holtzman discusses briefly. Xenakis relies on the principles of probability theory to determine the formal structure and unfolding of a composition.

And while Xenakis's compositions show that computer art need not be strictly patterned, the work of painter Harold Cohen demonstrates that it need not lack representational content. Holtzman himself makes this clear in his discussion of Cohen's AARON, a computer that has drawn realistic human and plant shapes without the aid of a model (see “Painting by Number,” *TR May/June 1995*, page 60). Thus digital art is capable of reflecting a disordered and altogether earthly human existence, Holtzman's theorizing to the contrary.

For all that, Holtzman's starting premise is, I believe, correct: computers will play a major role in the future of art. They will even do so in some of the ways outlined in *Digital Mantras*. But to focus solely on art that is utterly structured and abstract is to limit a lively dialogue between opposed traditions. The discussion between chaos and form, and content and abstraction, will continue. ■

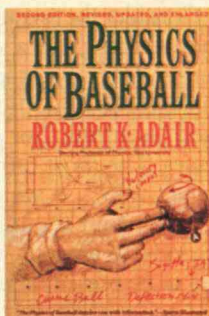
ROB HENN is a Boston-based freelance writer with a strong interest in computers and art.

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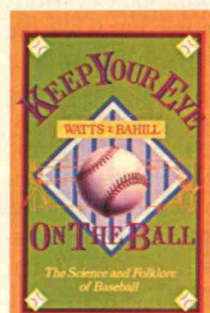
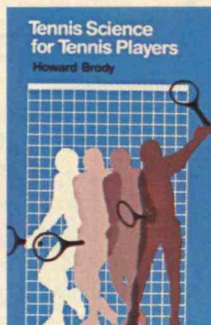
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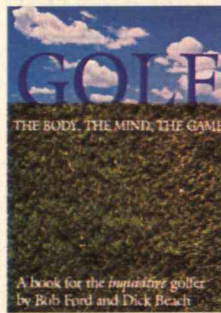
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## LETTERS

CONTINUED FROM PAGE 9

## FORMULA FOR PROFIT

"And Now the Farm Report" (*Phenomena*, *TR* January 1995) explains how infant formula based on cow's milk will be more similar to human milk in two ways with a new treatment. This is not a value-neutral research topic, as the presentation in this column might suggest. The piece was reprinted in *Resource*,



the magazine of ASAE—the society for engineering in agricultural, food, and biological systems, under the title "Mooove Over Mom, Cows' Milk Closing In" (February 1995). As inaccurate and offensive as this title is to nursing mothers and babies—as if a human mother should feel threatened that a human baby might prefer a cow, a formula, or a bottle—it does indicate that the intent of formula companies and research is to displace human mother's milk with a commercial, profitable product.

Poor digestibility and allergic reactions are only two of the many problems associated with formulas. Although research may remove these obstacles, formulas still would not be able to replace the love in the breastfeeding relationship or the antibodies made by the mother specific to her child's environment.

ELIZABETH A. GRASER  
Honolulu, Hawaii

## A TAXING REVIEW

Here's what I learned from Jonathan Schlefer's review of *America: Who Really Pays the Taxes?* (*TR* February/March 1995): Schlefer does not believe high tax rates influence investment decision making, he supports progressive taxation, and he likes the idea of a supranational entity collecting taxes to "temper capitalism, and promote social welfare."

Although Schlefer needs a soapbox, I suspect he will have considerable trouble gathering a crowd with his questionable ideas. The authors deserve a thoughtful critique of the book they wrote, and not of the book Schlefer thinks they should have written.

TIMOTHY B. PETERS  
Berkeley, Calif.

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# Phenomena

• BY DAVID BRITTAN •

## Science You Can Eat



**ALWAYS USE A CONDIMENT** • A dollop of horseradish, long considered indispensable with prime rib, may also be the perfect accompaniment to many wastewater-cleanup efforts, according to researchers at the Pennsylvania State University. Scientists have known for years that an enzyme called horseradish peroxidase had the potential to rid industrial wastewater of phenols—often-toxic byproducts of steelmaking and other common industrial processes. Combined with peroxide, the enzyme converts phenols into polymers that can be filtered out of the water. But people always assumed that horseradish peroxidase would have to be applied in a purified form that is prohibitively expensive. They assumed wrong, say the Penn State scientists. Ordinary minced horseradish knocks phenols out of wastewater in 30 minutes, can be reused up to 30 times (thanks to sturdy plant tissue, which immobilizes the enzyme), and costs thousands of times less than purified enzyme, according to Jean-Marc Bollag, co-director of the school's Center for Bioremediation and Detoxification, and Jerzy Dec, a research associate. The condiment works even better, they say, than two other experimental phenol-fighting compounds: minced potato and white radish.

**MINCE THIS** • What makes horseradish taste different from, oh, say, white radish? Important flavor components of any food or beverage are the aromas produced by volatile gases that waft up to the olfactory organ through the nasopharynx, at the back of the throat. Food scientists have never had a reliable way to study these "retronasal" aromas, since they're not the same scents one detects by merely sniffing food. Now, though, flavor chemists in Cornell University's Department of Food Science and Technology believe they can isolate and quantify the odors. The Retronasal Aroma Headspace Simulator is an artificial mouth—well, actually it's described as a glorified Waring blender—that subjects food to the same physical and chemical processes as a human mouth. The machine's blade slices and dices the way teeth do, while artificial saliva mimics the pH of the mouth and copper coils warm the apparatus to body temperature. The volatile emanations in the area above this churning mixture (in the "headspace," as chemists say) correspond to the retronasal aromas generated by chewing. The scents pass through a gas chromatograph, an instrument used in separating and identifying volatile compounds. At that point, an even more sophisticated tool—the human nose—can take over, sampling the component aromas and judging which ones are most responsible for a food's overall taste, according to Deborah D. Roberts, a food-science grad student who helped develop Cornell's artificial mouth. That same nose can rule out chemicals that don't contribute to flavor. "Instruments like the gas chromatograph will detect the volatile peaks for all the compounds in a complex food or drink," Roberts reported at a recent

American Chemical Society conference, "but that doesn't mean every compound has an aroma." Knowing which substances are most strongly perceived helps food scientists to synthesize and improve the flavors of foods and beverages.

**ULTRABRIGHT CLEAN** • With an artificial mouth, you don't have to worry about tooth decay. But because most ordinary mortals still do, researchers in Rochester, N.Y., are working on a laser technique designed to prevent cavities. John Featherstone, chair of the Department of Oral Sciences at Eastman Dental Center, and Wolf D. Seka, a senior scientist in the Laboratory for Laser Energetics at the University of Rochester, use bursts of laser light to briefly heat tooth enamel to 1,000° C. At this temperature, they say, the enamel's outermost surface melts, expelling calcium carbonate molecules—which are prone to decay—from its crys-



talline structure. The form of calcium that remains, calcium phosphate, is far tougher: the scientists report that the laser treatment boosts the enamel's resistance to acids by 70 to 85 percent and, when supplemented with fluoride, cuts decay to zero. Because the laser light is pulsed—allowing the tooth to cool between bursts—and finely tuned so it is absorbed mainly by the enamel, the procedure doesn't harm the tooth's delicate pulp, the researchers say. Just how

long the protection lasts is not certain. What is certain is that a dentist armed with a powerful carbon-dioxide laser will have patients' undivided attention.

**FISH AGAIN?** •

"Phenomena" began its existence with fish, has always done fish, and, dammit, will continue to do fish, without apology or explanation, so long as these vaguely humorous creatures remain the subject of fascinating and useful discoveries like this one: Robert Lindsay, a food scientist at the University of Wisconsin at Madison, may not know what makes horseradish taste different from white radish, but he believes he knows what makes horse mackerel taste different from whitefish. The key to the milder flavor of most saltwater species relative to freshwater species is diet. Marine fishes ingest regular doses of bromophenols, chemicals that occur naturally in algae and other sea organisms low on the food chain. According to Lindsay and colleagues in the University's Aquaculture Program, it is the absence of bromophenols in the freshwater diet that causes fish such as trout to taste fishy. The researchers have tested this hypothesis by feeding small amounts of bromophenols to several freshwater species and then feeding the fish, in turn, to student volunteers, along with the same species minus the bromophenols. In most cases the students preferred the flavor of bromophenol-fed fish. The change in diet is even supposed to have made crayfish—another habitué of the "Phenomena" page—taste like lobster. Lindsay is now investigating the commercial potential of this regimen, which he believes could net big gains for freshwater aquaculture. ■



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